UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERE ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
SILVER SPRING, MARYLAND

ENVIRONMENTAL ASSESSMENT OF LITTLE LAKE SHORELINE PROTECTION/DEDICATED DREDGING NEAR ROUND LAKE

CWPPRA PROJECT BA-37

LAFOURCHE, LOUISIANA

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1.0 INTRODUCTION

This Environmental Assessment (EA) evaluates the impacts of activities to protect, nourish, and create wetlands in the southwestern area of Little Lake known as Round Lake. The project is called Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake and is located in south-central Lafourche Parish, in the Barataria Basin, Louisiana (Figure 1). It contains approximately 1,374 acres (556 hectares) of brackish to intermediate marsh centered at latitude 29°28'40" N and longitude 90°11'25" W. The proposed project would establish 25,000 feet (7,620 meters) of shoreline protection, create 551 acres (223 hectares) of marsh in open water, and nourish 406 acres (164 hectares) of broken marsh with material pumped from Little Lake.

This project is funded by the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) of 1990 (16 U.S.C. §§ 777c, 3951-3956). In accordance with CWPPRA, the heads of five Federal agencies and the Government of the State of Louisiana comprise a Task Force to implement a "comprehensive approach to restore and prevent the loss of coastal wetlands in Louisiana" (16 U.S.C. § 3952 (b) (2)). The Federal agencies involved are: the U.S. Army Corps of Engineers (USACE); the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS); the U.S. Department of Interior, Fish and Wildlife Service (FWS); the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS); and the U.S. Environmental Protection Agency (EPA). These agencies held public forums in coastal areas of Louisiana to determine wetland problems. Subsequently, comprehensive restoration and protection plans for each river basin were developed that listed the identified problems and potential solutions (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 1993). Each year thereafter, agency personnel reviewed the needs of each basin, suggested new projects, and prioritized projects for implementation. The Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake was included as part of Priority Project List 11 in January 2002 and was selected for Phase I (engineering and design) funding at the Breaux Act Task Force Meeting in January 2003.

1.1 Project Location

The project is located in the central Barataria Basin in Lafourche Parish, Louisiana. Located about 30 miles (48 kilometers) south southwesterly from New Orleans, the project is between the East and West Forks of Bayou L'Ours on the southwestern shoreline of Little Lake. Little Lake is located between Bayou Perot and Barataria Bay. The project, in the area of Little Lake known as Round Lake and near Brusle Lake, extends from Breton Canal (sometimes referred to as

Superior Canal) eastward to Plum Point (Figure 2). The project area encompasses approximately 1,374 acres (556 hectares) and is divided into three hydrologic subunits of shoreline and adjacent marsh: Area A - 1,074 acres (435 hectares), Area B - 94 acres (38 hectares) and Area C - 206 acres (83 hectares) (Figure 2).

1.2 Project Funding

CWPPRA is providing 85 percent of the funding for this project with 15 percent of the cost shared by the State of Louisiana Department of Natural Resources. The project is administered by a cooperative agreement between the LDNR and NMFS.

1.3 Technical Background

The Louisiana Coastal Zone contains approximately 7,900,000 acres (3,200,000 hectares) of which about 3,000,000 acres (1,200,000 hectares) are coastal marshes. These marshes convert to shallow open water at a rate of 24 square miles per year (62 square kilometers) (Barras et al., 1994, Breaux Act Newsflash, 2003). The site-specific factors influencing conversion of marsh to open water vary widely and are difficult to assess, but natural as well as anthropogenic factors are responsible.

The most important process in landscape dynamics in coastal Louisiana is the delta lobe cycle (Coleman, 1988). This cycle consists of natural periods of wetland creation and wetland loss. The landmass of the deltaic plain was built by a sequence of overlapping deltaic lobes that developed during the last 7,000 years. Marshes in the Barataria Basin received periodic inputs of sediments and freshwater from the Mississippi River during flooding events until the early 1900's. A series of flood prevention levees along the Mississippi River and closure of Bayou Lafourche at Donaldsonville isolated marshes from the freshwater supply. Because average rainfall (64 inches or 162 centimeters per year) exceeds average evapotranspiration (40 inches or 102 centimeters per year) by about 24 inches (60 centimeters) per year in southeast Louisiana, there are extensive non-saline marshes in Barataria Basin (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 1993). The only sources of freshwater and sediment input to the basin are introduced into wetlands through siphons at Naomi, West Point a la Hache, a freshwater diversion at Davis Pond that opened in March 2003, and Locks at Algiers, Harvey and Empire. This lack of fresh water and the loss of the accompanying sediments, nutrients and hydrologic influence, form the most critical problem of the Barataria Basin (Barataria-Terrebonne National Estuary Program, 1995).

Water volume and levels in the Barataria Basin are influenced strongly by tides, winds, and precipitation, therefore, water exchange within the basin is highly variable. Little Lake is centrally located between Bayou Perot and Lake Salvador along the dominant water exchange route between the upper and lower basin (Richie, 1985; Richie and Penland, 1989)

1.3.1 Wetland Loss

Land loss rates in Louisiana have been reduced from 39 square miles (101 square kilometers) per year between 1956 and 1978 to 24 square miles (62 square kilometers) per year from 1990 to 2000. For the entire period, the loss rate has been 34 square miles (88 square kilometers) per year (Breaux Act Newsflash, 2003). The Barataria-Terrebonne Basin, south of New Orleans, has the greatest wetland loss in the state. This area accounted for 43 percent of Louisiana's loss from 1956 to 1978, 61 percent from 1978 to 1990 and 66 percent from 1990 to 2000. Without restoration or preservation efforts, the predicted loss could be as much as 80 percent by 2050 (Breaux Act Newsflash, 2003). Natural wetland loss results from compaction and subsidence of deltaic deposits, eustatic sea level rise, physical substrate scouring, and erosion exacerbated by periodic tropical cyclonic storms (Craig et al., 1979; Boesch et al., 1983). Herbivory also may accelerate wetland loss (Nyman et al., 1993).

In addition to natural processes, human activity also causes wetland loss. Anthropogenic activity accounted for 26 percent of total wetland loss within Louisiana between 1955 and 1978 (Turner and Cahoon, 1988). These direct losses were caused by dredging canals, creating spoil banks, draining land, and expanding agricultural and urban areas. Human activity also causes wetland loss indirectly. Turner and Cahoon (1988) attribute indirect causes of wetland loss to five interrelated effects. These include temporal trends in estuarine salinity, saltwater intrusion in waterways, saltwater movement in marshes, plant responses to salinity change and submergence, and subsidence, water level rise and sediment deprivation. Indirect losses were exacerbated by levee construction for flood protection along the Mississippi River (Templet and Meyer-Arendt, 1988), extensive canal construction associated with oil and gas exploration (Turner et al., 1982), and navigation channel development and maintenance dredging. These large-scale perturbations altered hydrological conditions and sediment distribution over large areas and facilitated saltwater intrusion into coastal marshes.

Since 1932, Barataria Basin has lost almost 17 percent of its land area (Dunbar et al., 1992). Recent annual wetland loss estimates in Barataria Basin range between 5,200 acres (2,104 hectares) (Dunbar et al., 1992) and 7,100 (2,873 hectares) (Barras et al., 1994) per year. At this rate, Barataria Basin will lose up to 142,340 acres (57,605 hectares) of land during the next 20 years. The subsidence rate in the Barataria Basin, based on USACE tide gauge readings between 1947 and 1978 at Bayou Rigaud, Grand Isle, Louisiana, is 0.03 inches (0.80 centimeters) per year (Penland et al., 1989).

The USACE (Britsch and Kemp, 1990; Dunbar et al., 1992) and United States Geological Survey (USGS) (Barras et al., 1994, 2002) calculated

land loss rates for different time periods. Shoreline erosion and wetland loss in the Little Lake mapping unit resulted in the loss of approximately 53 percent of the 1932 acreage by 1990. The high wetland loss rate in this area generally is caused by shoreline erosion, subsidence and channel construction that results in altered hydrology. During preparation of the candidate fact sheet for this project, Sweeney (2001) made a detailed study of land loss rates in the project area. A land loss rate of 2.01 percent per year (derived from 1978 and 1993 data) for Area A was used in the Wetland Value Assessment (WVA) analysis. This figure is slightly higher than the overall rates for the entire Little Lake mapping unit (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, Appendix D), however the land loss maps clearly indicate that some of the loss in this mapping unit is concentrated in the vicinity of the project area (Figure 3). Only shoreline erosion rates were applied to future with project (FWP) or future without project (FWOP) scenarios for Areas B and C. FWOP assumptions for Area A, based on total area of 1,074 acres (435 hectares) at target year 20 were 336 acres (136 hectares) of marsh and 738 acres (299 hectares) of open water and FWP 851 acres (235 hectares) of marsh and 223 acres (90 hectares) of open water (Sweeney, 2001).

Bristch (2001) calculated the erosion rates for shoreline retreat for Areas A, B, and C, independently. The positions of the 1932 and 1988 shorelines were measured at 21 transects, and annual rates were derived for each transect. Note that localized areas of extremely high erosion were not included in the analysis, and that the high and low values were not used when calculating the "average" rate. Shoreline erosion rates used in the WVA analysis were Area A - 20 feet (6 meters) per year, Area B - and C - 40 feet (12 meters) per year (Sweeney, 2001). The WVA predicted that 57 acres (23 hectares) would be lost in Area B and 139 acres (56 hectares) would be lost in Area C under FWOP conditions.

1.3.2 Habitat Diversity

Project area habitat includes intermediate to brackish marshes and water, i.e., shallow water near the Little Lake shoreline, natural bayous and open water areas within the marsh, and man-made canals. Because of the various elevations and salinity regimes, vegetative types range from intermediate to brackish along the shoreline of Little Lake to upland species on spoil banks, with typical transitional, wetland and submerged intermediate or brackish vegetation in the marsh and open water areas.

Wildlife resources in the project area include game and nongame animals and commercially important furbearers and alligators. There are a great variety of resident and migratory birds, including the waterfowl that traverse the Mississippi Flyway.

The intermediate to brackish marshes of the project area provide nursery and forage habitat for numerous recreationally and commercially important estuarine and estuarine-dependent marine finfish, mollusks and crustaceans.

1.3.3 Current Conditions

Marshes throughout the project area are comprised of intermediate to brackish vegetation. The project is located in an area protecting approximately 3,000 acres (1,214 hectares) of fragile interior marshes between the Little Lake shoreline and Bayou L'Ours Ridge. Little Lake shoreline is eroding at an alarming rate of between 20 and 40 feet per year and the interior marshes are predicted to lose 2.01 percent per year over the target life of 20 years (Sweeney, 2001).

Projects within Barataria Basin that might affect the marshes around Little Lake include the Freshwater Diversion at Davis Pond that became operational as of March 2003. Completion of the Landbridge Shoreline Protection Project is expected in 2004 (U.S. Department of Agriculture, 2000). Protection and restoration projects for barrier islands that form the southernmost boundary of Barataria Basin have been proposed for CWPPRA funding. Barrier island projects, pending authorization and funding, within the Barataria Basin include East/West Grand Terre Islands, Pelican Island, Pass La Mer to Chaland Pass, and Pass Chaland to Grand Bayou Pass.

1.4 Preliminary Performance

The Task Force identified problems and potential solutions in the Barataria Basin during the developmental stages of the Louisiana Coastal Wetlands Restoration Plan (1993). In 1990, the State of Louisiana petitioned the EPA for inclusion in the National Estuary Program. The Barataria-Terrebonne estuary was chosen for comprehensive study and a multi-volume conservation and management plan was prepared (Barataria-Terrebonne National Estuary Program, 1995). The Coast 2050 report (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, 1998) further documented the problems and proposed solutions, by regions, for the entire state. In Region 2, which includes the project area, Strategy 25 (Preserve bay and lake shoreline integrity on the land bridge) stated that "the southern shores of Little Lake are in danger of breaching into interior marsh...and that these shorelines should be stabilized." Strategy 26 (Dedicated dredging to create marsh on the land bridge) mentions dedicated dredging to preserve the Bayou L'Ours ridge. That ridge is just south of the project area and forms the southern hydrological barrier for the area in which the project is located (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, 1998).

Recent studies on a large scale addition of sediments to a submerging marsh habitat demonstrated that the negative effects of sea level rise can be offset by increasing marsh elevation, thereby improving conditions for plant growth (Kuhn and Mendelssohn, 1999). Another study showed that in addition to a higher elevation, improved conditions included the reduced potential of toxic sulfides and increased soil fertility (Mendelssohn and Kuhn, 1999).

Projects using hard structures for shoreline stabilization have been constructed to stabilize or reduce shoreline erosion around lake and bay shorelines and along navigation canal banks. CWPPRA projects on the Boston Canal (TV-09), Turtle Cove (PO-10) and Lake Salvador (BA-15) have been effective in protecting lake shoreline from erosion (Belhadjali and Cowan, 2003).

The plan for Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake project was not developed until 2001 and considered the above proven techniques. The project was approved on Priority Project List 11 in 2002. Subsequently, the area has been inspected and pertinent data, including geotechnical investigations, (Eustis Engineering Company, Inc., 2003) were collected by project engineers, and administered by Federal and State sponsor personnel.

1.5 Authorization

The NMFS is the Federal sponsor for implementation of Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake project that was included on the Eleventh Priority Project List. The sponsor's responsibility includes project oversight and conducting the evaluation and other activities involved for final decision-making in compliance with the National Environmental Policy Act (NEPA) of 1969.

2.0 PURPOSE AND NEED FOR ACTION

The major goal of CWPPRA is to restore and prevent the loss of coastal wetlands in Louisiana. Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake project was proposed and designed to partially meet that goal by reducing shoreline erosion, and creating and nourishing marsh in an area of Lafourche Parish.

2.1 Purpose

The purposes of this project are: (1) create and nourish critical acres of marsh in the project area that are converting to open water because of subsidence and erosion; and, (2) to protect the shoreline of Little Lake from erosion between Lake Brusle and John the Fool Bayou (near the base of Plum Point).

2.2 Need for Action

There is a critical need to create new wetlands and nourish existing wetlands to slow or offset marsh loss in Barataria Basin. Also, there is a critical need to reduce the shoreline erosion rate of 20 feet per year (Area A) and 40 feet per year (Areas B and C). Since the Louisiana land loss rate is 24 square miles per year, the proposed action provides a unique opportunity to locally reduce that rate of loss by preventing shoreline erosion and creating and nourishing marsh.

2.2.1 Protection of Existing Wetlands

Recent erosion rates in the project area of 20 (Area A) to 40 (Areas B and C) feet per year are expected to continue, thereby causing the loss of emergent wetlands surrounding the lake. As the shoreline retreats and loses its integrity, the fragile interior marshes also convert to open water at a greater rate. The project area marsh is expected to convert to mostly open water over the next 20 years if these problems go unchecked. The loss of intermediate marsh in the Louisiana coastal zone from 1956 to the present represents a significant natural resource loss. Intertidal marshes are among the most productive ecosystems on earth and their rapid disappearance may significantly impact the economy of South Louisiana. "The impacts on human populations, the oil and gas infrastructure, fisheries and the seafood industry and wildlife will be considerable if coastal wetlands continue to disappear" (Breaux Act Newsflash, 2003). Action is therefore needed to provide immediate shoreline protection and stabilization of existing wetlands.

2.2.2 Protection of Wildlife Habitat

Continued wetland loss reduces habitat availability for many wildlife species in the project area and coastwide. Wetland loss increases shallow open water by approximately 90.4 square kilometers (34.9 square miles) per year in coastal Louisiana (Barras et al., 1994). Project area marshes are heavily utilized by wildlife. Reversing declines in habitat availability for wetland wildlife species requires creating new or nourishing existing emergent wetlands, and protecting existing wetlands from erosion.

2.2.3 Protection of Marine Fisheries Habitat

Little Lake is part of the large Barataria estuary and as such provides significant estuarine habitat for marine-transient and resident fishery species. Interface areas are particularly valuable to estuarine dependent fish and crustacean species. This estuary provides nursery and foraging habitats that support the production of commercial and recreational fish and shellfish. Since Little Lake is central to the dominant water exchange route, tidal and wind induced currents carry larval and postlarval fishery

organisms into lower salinity nursery and feeding habitats of the project area. Action is needed to reduce shoreline erosion rates, nourish existing marsh and create new marsh areas to provide high quality fishery habitat.

2.2.4 Protection of Infrastructure

There are no state or parish roads within the project area. A large pipeline canal (Tennessee Gas Pipeline Canal) transects the marsh between Round and Brusle Lakes and the pipeline extends into Little Lake. Breton Canal, the large pipeline canal that forms the western boundary of the project area west of Brusle Lake, also extends into and across the Bay L'Ours area of Little Lake. Oil and gas activity in the area include several wells, either active, dry, or plugged and abandoned in Little Lake near the proposed borrow area and pipelines connecting producing wells on the eastern side of the borrow area.

Tidal and wind-induced waves and currents cause erosion along the marsh/water interface. The roots of marsh vegetation help to stabilize soils and provide some protection for the pipeline and stabilization to canal banks. Action is needed to reduce shoreline erosion near the pipelines.

3.0 ALTERNATIVES INCLUDING PROPOSED ACTION

The project site and scope were identified by NMFS as part of Task Force submittals for the Eleventh Priority Project List (LAcoast, 2003b). This project is one of five selected by the Task Force for the Barataria Basin for the year 2001 (LAcoast, 2003a). The recognition that the shoreline was retreating at a rapid rate and that interior marshes also were breaking up rapidly stimulated interest in designing a plan to alter the natural course of action. Consequences of the proposed action are discussed in Section 5.0.

3.1 No-Action Alternative

The no-action alternative would allow current shoreline erosion rates to continue. Marsh would continue to convert to open water at an even greater rate than the current 2.01 percent per year loss rate due to increased water circulation in the absence of a shoreline barrier. The no-action alternative would thus fail to protect existing fragile marshes in the project area. As evidenced by the public funding through CWPPRA, public needs to create and/or nourish existing marshes to offset losses in the area and to protect those marshes would not be met by the no-action alternative.

3.2 Shoreline Protection Without Marsh Creation and Nourishment

This alternative would establish shoreline protection from Breton Canal west of Brusle Lake to John the Fool Bayou at the base of Plum Point. Shorelines in this area are retreating at the rate of 20 to 40 feet per year. Construction of over 25,000 feet of rock dikes would slow this retreat significantly by reducing water currents and lake processes that are causing erosion of the Little Lake shoreline. Interior marsh deterioration and land loss rates would continue near the present rate, however. This alternative would address only one of the goals and therefore was not selected.

3.3 Marsh Creation Without Shoreline Protection

Marsh creation and nourishment (i.e., 551 acres of intertidal wetlands created along the Little Lake shoreline and 406 acres of marsh nourished by a layer of sediment) would take place in an area bounded by the Tennessee Gas Pipeline Canal on the west, Bayou de Chene and Round Lake on the north and John the Fool Bayou on the south and east. This would add to marsh in the project area and reduce conversion of marsh to open water. Shoreline erosion would continue at the present rate, however, and that would reduce the longevity of the created and nourished marsh. Since this alternative would address only one goal, it was not selected.

3.4 Shoreline Protection and Marsh Creation (Preferred Alternative)

Installing shoreline protection, creating intertidal wetlands and nourishing intermediate marsh is the preferred alternative (See Figure 4 for the location and Figure 5 for an overview of the project). Because project engineers used the English system of measurement in their calculations, no metric equivalents will be shown. Completion of this project is expected to:

(1) Prevent erosion along over 4 miles of Little Lake shoreline by constructing 25,000 feet of rock dike (Figure 5),

(2) Create 551 acres of intertidal wetlands along the Little Lake shoreline,

(3) Nourish and maintain 406 acres of intermediate marsh, and

(4) Reduce land loss rates by 50 percent over the 20-year life of the project.

3.4.1 Shoreline Protection

Approximately 25,000 feet of freestanding rock dike (Figures 8, 9, 10, and 14 through 19) with a geotextile base (Figures 10 and 26) will be

constructed. Rather than installing the dikes along the actual shoreline, the dike will be constructed in straight segments, at a depth of –2 feet North American Vertical Datum (NAVD 88). The resulting distances that the dike will be from the existing shore range from 30 to 1,800 feet (Figures 5 and 14 through 19) (Belhadjali and Cowan, 2003). Rock dike cross sections at stations identified on Figure 5 are shown in Figures 20 through 22. (All following elevations are reported in NAVD 88 datum.) The –2-foot contour is close enough to the shoreline that wave energy should not regenerate between the dike and existing marsh. Following the shallower contour decreases the volume of rock necessary for construction, thus resulting in a more cost effective project. Construction of the dike will start at both the east and west ends of the project area; however, the dike will not be completed until after the marsh creation portion of the project is finished. The top of the dike will be at +2.5 feet NAVD 88, have a crown width of approximately 3.5 feet, a 1:4 lakeside slope and a 1:2 marsh side slope. Settlement plates (Figure 26) will be installed along the centerline of the rock dike (Figures 14-19) in order to facilitate the measurement and attainment of the target height of rock. The dike will vary in width between 30 and 43 feet and will cover a maximum of 25 acres of shallow water bottoms in Little Lake. The lakeward toe of the dike will be a minimum of 40 feet from the flotation area. Rock for construction of the dike will be in the 250-pound class.

Access to the construction site will require dredging 42,700 linear feet of channels in Little Lake (see Figures 5, 14, 15, 18, and 19). The four access channels will be bucket dredged to a bottom width of 60 feet and a maximum depth of –5 feet, with assumed 1:2 side slopes. Dredging for the access channels will begin where the depths are not sufficient for the construction barges or at the edge of the borrow area (see Figure 5). Material bucket dredged will be side cast a minimum of 20 feet from the channel and to a maximum elevation of +3.5 feet. A 50-foot gap (Figures 6 and 7, and 14 through 19), and temporary navigation warning signs (see details on Figure 25) will be placed in the spoil areas at 1,000-foot intervals. This material shall be backfilled prior to completion of the project.

The flotation channel, parallel to the rock dike, will be bucked dredged to a bottom width of 80 feet and a maximum depth of –5 feet, with assumed 1:2 side slopes. Turning basins will be dredged at the junction of the access and flotation channels. Material bucket dredged either will be side cast or placed behind the rock on the marsh side. Any side cast material will be replaced in the flotation channel following construction of the rock dike. Material placed behind the rock structure will be a minimum of 10 feet from both the rock and existing shoreline (Figures 8 through 10 and 14 through 19) with a maximum elevation of +2.1 feet. The flotation channel will be offset approximately 40 feet from the rock structure.

Where temporary spoil is placed, a 50-foot gap and temporary navigation warning signs will be placed along the channel at 1,000-foot intervals (Figures 6, 14 through 19, and 25). Approximately 110 acres of water bottom in Little Lake will be deepened for the access and flotation channels and turning basins.

3.4.2 Fishery Access

To provide adequate water exchange and to allow marine organism ingress and egress, an opening, or fish gap (Figures 8 and 9), in the rock dike will be placed near natural openings or distances ranging from 740 to 1,495 feet apart (See Figures 14 through 19). Each fish gap opening will be 20 feet wide. The base of the gap will be lined and flush with the existing bottom to allow marsh access to bottom-dwelling species and to prevent toe scour of the rock dike (Figure 10). Previous plans indicated that there would be a rock barrier shoreward of the gap to reduce the wave energy. However, the rock dike will be too close to the shore for construction of the additional barrier and wave energy would not have space to regenerate between the dike and the shoreline.

3.4.3 Marsh Creation and Nourishment

Material dredged from over 1,300 acres in Little Lake will be used to create and nourish marsh. For marsh creation (Figures 11, 12, 23, and 24), dredged material will be placed to intertidal elevations in approximately 90 percent of the open water areas to create an estimated 551 acres at intertidal elevation. Approximately 10 percent of the existing interior open water will not be filled so as to maintain selected features such as tidal creeks and ponds (See Figure 5, cross-hatched area, and Figures 23 and 24). Additionally, 6 to 12 inches of dredged material will be placed over 406 acres of existing marsh for marsh nourishment (Figures 11, 12, 23, and 24). No discharge point shall be within 1,000 feet of the project boundary. The existing marsh has an average elevation of +1.2 feet and is located in a highly subsiding area (T. Baker Smith and Son, Inc., 2003). The maximum allowable fill elevation is +2.4 feet; the target elevation is 2.1 feet with a tolerance of $\pm$0.3 foot. The marsh nourishment is intended to provide a more optimal marsh elevation long term without promoting the development of upland vegetation. This target elevation is based on a geotechnical report that evaluated settlement of the fill over time considering soil conditions, subsidence, storm events, and estimated rates of compaction and shrinkage of the material as it dewaters (Eustis Engineering Company, 2003).

Approximately 50,000 plants of smooth cordgrass *Spartina alterniflora* will be planted within the marsh creation area (Figure 11). Plants will be nursery grown and will be multi-stem. The volume of plants with

container soil is estimated to be 600 cubic yards. Since the marsh creation area is quite large, vegetative plantings will be limited to areas determined to lack vegetative source material, especially around the perimeter where additional stabilization is needed. Initial vegetative plantings will occur as soon as possible after dewatering; the remainder of the created platform will be seeded the following January or February.

Containment dikes (Figures 5, 12, 23, and 24) will be constructed as required to provide a barrier along the perimeter of the project area where existing marsh or spoil bank elevations will not adequately contain the material. These dikes will be constructed to a maximum elevation of +3.5 feet with an 8-foot crown and 1:3 side slopes and will cover approximately 4 acres. Material for these containment dikes will be bucket dredged 40 feet from placement and to a maximum depth of –8 feet. The borrow area for the retention dike will be filled during the marsh nourishment portion of the project. For stability, the containment dike will tie into existing marsh by approximately 20 feet on each side (Figure 12). Internal low-level training dikes also may be used to direct the flow of dredged material. If the containment and training dikes have not subsided to marsh elevation before the vegetation is planted, they will be degraded.

The borrow area for marsh creation and nourishment (Figures 5 and 13) will be in Little Lake. Material will be hydraulically dredged from 1,300 acres to a depth not exceeding -10 feet and pumped to the designated area for marsh creation or nourishment. A magnetometer survey was used to configure the borrow area so as to avoid dredging near pipelines by approximately 500 feet.

4.0 AFFECTED ENVIRONMENT

The project area is located approximately one-third of the distance between Lake Salvador and Barataria Pass in the southern half of Barataria Basin. Little Lake is part of the large estuarine circulation system that transports water to and from Barataria Pass, through Barataria Bay and a series of smaller bays into Bayous Perot and Rigolettes to Lake Salvador. Salinities range from saline at the barrier islands, brackish through the bays, intermediate near and north of the project area and fresh at Lake Salvador.

Other CWPPRA-funded restoration projects in the vicinity of Little Lake are: BA-27 Barataria Basin Landbridge Shoreline Protection Project Phases 1, 2 and 3 (U.S. Department of Agriculture, 2000), partially completed; BA–2 GIWW (Gulf Intracoastal Waterway) to Clovelly Hydrologic Restoration (U.S. Department of Agriculture, Soil Conservation Service, 1987 and 1990), completed. The now on-line USACE freshwater diversion at Davis Pond will help to offset salinity peaks and add much needed freshwater to Barataria Basin. Twenty-six CWPPRA projects have been approved for Barataria Basin, (LAcoast, 2003a) that collectively address major hydrologic, land loss, and erosion concerns in the basin.

4.1 Physical Environment

4.1.1 Geology, Soils and Topography

The Mississippi River has changed its course a number of times during the last 10,000 years, building a series of six major overlapping delta lobes. As a new delta lobe grows, the pathways of water flow become longer and less efficient, so that eventually (every 750 to 1,000 years) the river diverts to another location. Lacking the sediment supply, a series of changes begins in the abandoned lobe as sediments compact and sink under their own weight (Penland and Suter, 1988). After compaction and sinking processes begin, waters of the abandoned lobe become increasingly saline and salt-tolerant vegetation becomes established, starting at the seaward edges and moving inland (Reed, 1989). Marine processes, rather than riverine processes, become the primary factor in transporting sediments from their source in the delta lobe.

The last major diversion was approximately 1,000 years before present (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, 1998). To prevent the Atchafalaya River from capturing the flow, the Mississippi River has been controlled since the mid-1950s so that approximately 70 percent of the water flows through the present channel and 30 percent through the Atchafalaya River. Both the reduced flow and containment of sediment-laden floodwaters within levees has exacerbated the deterioration process of the Modern Delta (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, 1998).

The project area, located in the Barataria Basin, was formed on the outer fringe of three earlier Mississippi River deltas (i.e., the Cocodrie Complex, the St. Bernard Complex and the Lafourche Complex) (Kolb and Van Lopik, 1958). Marshes in this area were built up by a combination of vegetative growth, peat accumulation and alluvial processes. Analysis shows the soils are composed of peat (decomposed herbaceous plant material), roots and root mats (underground herbaceous material) and the clayey alluvium (U.S. Department of Agriculture, Soil Conservation Service, 1984).

Soils throughout the project area are classified as Lafitte-Clovelly Association (U.S. Department of Agriculture, Soil Conservation Service, 1984). These soils are often severely flooded or ponded, have excess humus and slow percolation. Deposits of herbaceous plant materials formed the Lafitte soils that now occur in brackish marshes, and in basins between natural streams. A thick surface layer of semifluid, saline muck and underlying material of semifluid, saline clay and silty clay loam characterize Lafitte soils. Clovelly soils are similar to Lafitte soils but

have thinner organic layers over mineral material and usually occur on submerged ridges along natural streams. The underlying material is semifluid, saline clay. This soil association is not suited to crops, pasture, woodland or urban areas due to flooding, salinity and low strength. The soils support wetland vegetation, however, that is heavily utilized by aquatic and wildlife species (U.S. Department of Agriculture, Soil Conservation Service, 1984).

Elevation ranges from sea level to about 1 foot (0.3 meter) above sea level. Slope is less than 0.2 percent (U.S. Department of Agriculture, Soil Conservation Service, 1984).

4.1.2 Climate and Weather

Little Lake and Barataria Basin has a subtropical climate, which is characterized by long, hot and humid summers, and short, mild and humid winters. Average daily maximum temperatures between May and October range between 79° to 90° F (31° and 32° C). Average daily maximum winter temperatures between November and April range from 61° to 71° F (16° to 21°) with relative humidity between 30 and 85 percent. Cold spells usually last no more than 3 days because of the dominance of warm gulf air moving inland from the coast year round. A winter temperature of 32° F (0° C) or less is expected 15 days per year with a 20 percent chance of temperatures falling below 20° F (–6° C) during the winter. The highest wind velocities accompany northerly winds. From October through March, cold-front passages occur at least once per week. Coastal and bay water levels usually rise 1 to 1.5 feet (0.3 to 0.5 meter) above normal before frontal passage due to the strengthening of the pre-frontal southerly winds. North winds then force water level changes in the bays of 1 to 1.5 feet (0.3 to 0.5 meters) below normal (Reed, 1995).

The total annual rainfall is nearly 60 inches (1.5 meters) with about 60 percent falling during April through September. Thunderstorms occur on about 80 days each year. Snow rarely occurs and is seldom on the ground for more than a day. The growing season near the project area varies between 259 and 313 days (U.S. Department of Agriculture, Soil Conservation Service, 1984).

A hurricane goes ashore in Louisiana every few years and a few have been extremely severe, namely Andrew in 1992. There were several named subtropical storms during the intervening years, but none of consequence until 2002 when there were four hurricanes or tropical storms that impacted Louisiana. The paths of Hurricanes Isodore (September 26, 2002) and Lili (October 3, 2002) came closest to the Little Lake area (U.S. Department of Commerce, National Weather Service, 2003).

4.1.3 Air Quality

Air quality over Little Lake is good. Air masses are highly unstable in this area because of coastal activity. There are no industrial or automotive air emissions in the project area.

4.1.4 Surface Water Resources

There is no data on water quality of surface waters for the Round Lake area of Little Lake. However, the water quality in Little Lake is classified as an estuarine lake that is designated as fully supporting primary-contact recreation (e.g. swimming), secondary-contact recreation (e.g. fishing and boating), and fish and wildlife propagation, but not oysters (LDEQ, 2003). Suspected causes for impairment include turbidity and total fecal coliform counts. Suspected sources of impairment are waterfowl and sediment resuspension. All private oyster leases in Little Lake were purchased by the Davis Pond Oyster Lease Relocation Program. Now that there is no more commercial harvesting in Little Lake, LDEQ may reassess coliform standards in this area (Sabin, 2003).

Monthly salinity data from February 1988 through March 2003 from five different stations in Little Lake was analyzed (Champion, 2003). The average monthly salinity for that 15-year period was 17 parts per thousand (ppt). The highest salinity, 35 ppt, was recorded at all stations on October 30, 2000. Other spikes over 30 ppt occurred in June 1992, and October and November 1995 and salinities over 25 ppt occurred in every month except March, April, July and September. The lowest salinity recorded, 4.3 ppt, occurred in July 1991. Periods of salinity less than 10 ppt occurred at least once in every month except October. Long-term results of the Davis Pond Freshwater Diversion are expected to induce more intermediate conditions in the project area.

4.2 Biological Environment

4.2.1 Vegetative Communities

Project area habitat includes intermediate to brackish marshes (Chabreck and Linscombe 1978 and 1988; Chabreck et al., no date). Historically, marshes in this area have varied from an intermediate classification (O'Neil, 1949) to fresh in 1956 (Wicker, 1980). Between the 1950's and 1970's, project area marsh vegetation had shifted to species indicative of higher salinity communities and was classified as intermediate to brackish. It should be noted that at each classification, project area marshes are on or near the line of demarcation between habitat types. More recent habitat analyses classify Area A as intermediate, and Areas B and C as brackish. Observations from the July 12, 2001, interagency site visit suggest that all three areas are similarly dominated by wiregrass *Spartina patens* with

consistent, but less dominant occurrences of saltgrass *Distichlis spicata* and black rush *Juncus roemerianus*. Although on the habitat maps wiregrass is classified as brackish and the other two as saline, the intermediate model was used for the Wetland Value Assessment (WVA) because of the anticipated effects of the Davis Pond Freshwater Diversion (Sweeney, 2001).

Vegetative communities in the open water portion of the project area currently consist of small, scattered stands of widgeongrass *Ruppia maritima* and some coontail *Ceratophyllum demersum* and southern naiad *Najas quadalupensis*.

4.2.2 Essential Fish Habitat

The project area consists of shallow open water and brackish marsh. Tidally influenced portions of the proposed project area have been designated as Essential Fish Habitat (EFH) for postlarval, juvenile, and subadult life stages of brown shrimp *Penaeus azetecus*, white shrimp *P. setiferus*, and red drum *Sciaenops ocellatus*, as well as the adult life stage of red drum. Categories of EFH in the project area include estuarine emergent wetlands, mud substrates, and estuarine water column. Detailed information on Federally-managed fisheries and their EFH is provided in the 1998 generic amendment of the Fishery Management Plans (FMPs) for the Gulf of Mexico prepared by the Gulf of Mexico Fishery Management Council (GMFMC). The generic amendment was prepared as required by the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (P.L. 104-297). The Council's Essential Fish Habitat Amendment was partially approved by the NMFS in February 1999.

Sub-categories of EFH in the Little Lake project area, as designated by the GMFMC in the 1998 generic amendment of the FMPs for the Gulf of Mexico, are listed in Table 1 (GMFMC, 1998).

Table 1. Sub-categories of EFH in the Little Lake project area listed by species and life stage

Species	Life Stages	Sub-categories of EFH
Brown shrimp	Postlarval/juveniles	Marsh edge, SAV, tidal creeks, inner marsh
	Subadults	Mud bottoms, marsh edge
White shrimp	Postlarval/juveniles, Subadults	Marsh edge, SAV, marsh ponds, inner marsh
Red drum	Postlarval/juveniles	SAV, mud bottoms, marsh/water interface
	Subadults, adults	Mud bottoms

Coordination letters regarding EFH may be found in Appendix A.

4.2.3 Fishery Resources

A wide variety of estuarine-dependent fishery species are found in the Barataria Basin (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, 1999). Commercially fished species include brown shrimp, white shrimp, blue crab *Callinectes sapidus*, gulf menhaden *Brevoortia patronus*, and oysters *Crassostrea virginica*. These resources are species of national economic importance in accordance with Section 906(e)(l) of PL 99-602, the Water Resources Development Act of 1986. Sport fishes sought after include sand seatrout *Cynoscion arenarius*, spotted seatrout *C. nebulosus*, black drum *Pogonius cromis,* red drum and southern flounder *Paralichthys lethostigma.* Nearly all of these species vary in abundance from season to season due to their migratory life cycle, habitat preferences according to life stage, and the variation in salinity (Herke, 1978; Rogers et al., 1993; Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, 1999). Most spawn offshore in the open Gulf of Mexico and enter Little Lake as postlarvae or young juveniles to use the shallow lake bottoms and surrounding marshes as a nursery. Usually these species return to the open gulf as subadults or adults.

Oysters *Crassostrea virginica* historically were harvested from Little Lake. However the State of Louisiana bought out all the existing oyster leases located in Little Lake in 2001 under the Davis Pond Oyster Lease Relocation Program (Dunham, 2003).

4.2.4 Wildlife Resources

In 1990 and again in 2001, a census of wading birds and seabird nesting colonies was conducted in Louisiana. Twenty-seven species of colonial nesting waterbirds were studied (Martin and Lester, 1990; Michot et al., 2003). In the first study, Stations 304 and 237 were located west of the project area in the fastlands surrounding Bayou Lafourche. Stations 297 and 180 were east of Little Lake. Martin and Lester (1990) reported 100 nesting adult Forster's tern *Sterna forsteri* at Station 304; 40 each of little blue heron *Egretta caerulea*, cattle *Bubulcus ibis* and snowy egret E. thula, and white ibis *Eudocimus albus* at Station 237; 30 tricolored heron *Egretta tricolor* and 20 snowy egret at Station 297; and 300 Forster's tern at Station 180. None of these sites were active in the 2001. However, in the more recent survey, (Michot et al., 2003), Station 404, a new location with a new colony of 475 Forster's tern was located near Mud Lake, approximately 10 miles southeast of the project site. Station 343, a new location for an old colony, located approximately 6 miles southwest of the

project site, had 50 great egret *Casmerodius albus* nests (Michot et al., 2003). Although no wading bird rookeries are listed for Little Lake, wading birds could be expected to feed on small fish and invertebrates in the shallow areas near shore.

The intermediate to brackish marshes around Little Lake provide habitat for nutria *Myocastor coypus*, raccoon *Procyon lotor*, puddle ducks *Anas* sp., and alligator *Alligator mississippiensis*. Muskrat *Ondatra zibethicus*, mink *Mustela vison*, and river otter *Lutra Canadensis,* game such as white-tailed deer *Odocoileus virginianus*, rabbit *Sivilagus* sp., and snapping turtle *Macroclemys temmincki* (McNease and Joanen, 1978; and Palmisano, 1973) occur in the vicinity of the project area, especially in areas with intermediate-type vegetation.

Geese (snow goose *Chen caerulescens*), dabbling ducks (mallard *Anas platyrhynchos*, northern pintail *Anas acuta*, gadwall *Anas strepera*, blue-winged teal *Anas discors*, mottled duck *Anas fulvigula*, green-winged teal *Anas crecca*, and American wigeon *Anas americana*) and diving ducks (lesser scaup *Aythya affinis*, greater scaup *Aythya marila*, red-breasted merganser *Mergus merganser*, ring-necked duck *Aythya collaris*, redhead *Aythya americana*, canvasback *Aythya valisnera*, and bufflehead *Bucephala albeola*) occur along the coast. Most of these waterfowl breed in the northern plains and migrate to the coastal marshes of Louisiana for the winter. Geese are primary grazers and feed on rice, bulrush and marshhay cordgrass. Puddle ducks feed in water up to 15 inches (40 centimeters) deep and diving ducks in deeper water. Only the mottled duck nests within the project area (Condrey et al., 1995).

4.2.5 Threatened and Endangered Species

Threatened and endangered birds listed for Lafourche Parish include the bald eagle *Haliaeetus leucocephalus* (threatened), piping plover *Charadrius melodus* (threatened), and the brown pelican *Pelecanus occidentalis* (endangered) (U.S. Fish and Wildlife Service, 2003). Eagles typically nest from October through mid-May in bald cypress trees near fresh to intermediate marshes or open water in the southeastern parishes. The closest bald eagle nest is located approximately 4 miles away. Such a distance would significantly reduce construction–related disturbances and noise levels at that nest. Bald eagles may use the project area, however, for hunting/feeding; any displacement of bald eagles would be insignificant because of the large amount of suitable foraging habitat in the vicinity of the project area. The piping plover winters in coastal Louisiana and utilizes intertidal flats, beaches and associated dune systems, and other sparsely vegetated areas adjacent to flats and beaches. Although critical habitat for piping plover has been designated in areas along the Louisiana coast, that species is not expected to utilize the project area, and its critical

habitat does not occur there. The brown pelican may occasionally utilize the project area, however, its important nesting, feeding and resting habitats are located closer to the gulf shoreline.

The threatened gulf sturgeon *Acipenser oxyrhynchus desotoi* rarely occurs west of the Mississippi River; critical habitat for gulf sturgeon has been designated in the Pearl River Basin and the Lake Pontchartrain Basin within Louisiana. Thus the gulf sturgeon is not expected to utilize the project area and its critical habitat does not occur there. The endangered manatee *Trichechus manatus* is a transient species in Louisiana waters, occurring infrequently during summer months (i.e., June through September). Thus the likelihood of that species occurring within the project area at the time of construction is minimal.

Sea turtles have been reported along the Louisiana coast (Condrey et al., 1995). Dundee and Rossman (1989) report that Kemp's ridley turtle *Lepidochelys kempi* occasionally appears along the Louisiana Gulf coast. Possible factors related to this occurrence include the widespread availability of relatively shallow water marine and estuarine habitat with high turbidity levels from proximity to the Mississippi River (Frazier, 1980). In Florida, Kemp's ridley turtles routinely are found foraging in very shallow water, on shallow oyster reefs with nearby connecting channels (Schmid et al., 2002). The shallow depth in the project area, plus the nearby marshes and open water areas may be attractive for foraging and development sites for the Kemp's ridley, although the muddy bottoms and variable salinity may be deterrents.

Of the other four species of endangered sea turtles - the loggerhead turtle *Caretta caretta* and the green turtle *Chelonia mydas* are relatively common in the nearshore waters of the Gulf of Mexico. The loggerhead feeds on sponges, jellyfish, mollusks, crustaceans, sea urchins, fishes, seaweeds and grasses while the green turtle's diet is primarily marine grasses and macrophytic algae. The hawksbill turtle *Eretmochelys impricata* is usually found in seawater less than 49 feet (15 meters) and feeds on invertebrates, marine grasses and macrophytic algae. The leatherback turtle *Dermochelys coriacea* is found in deeper oceanic waters and feeds primarily on jellyfish (Condrey et al., 1995). Although all have been reported from Louisiana coastal waters, these four species are not likely to be found within the project area due to the unavailability of forage or suitable habitat.

Coordination letters regarding Threatened and Endangered Species may be found in Appendix A.

4.3 Cultural Environment

4.3.1 Historical or Archeological Resources

In the early 1700s, when the French initially settled in Louisiana, the Chitamacha, a group of Native Americans lived along Bayou Lafourche. The Bayougoulas, who formerly lived in Iberville Parish joined the Houmas who eventually relocated to the coastal marshlands, some in lower Lafourche Parish. Although not mentioned, it is possible that vessels of Native Americans utilized Bayou Lafourche and distributaries and ventured into Little Lake (McKenzie et al., 1995).

Due to the dependence on boat travel during the colonization of south Louisiana and the frequency of tropical storms in the area, there is a slight potential that historical boat remains may be located beneath the sediments that have accumulated in Little Lake. The State Historic Preservation Officer indicated that at Site LF53 on the National Register of Historic Places there were shards, shell and mammal bone fragments (Grandy, 2003). There are no plans for work to be conducted in this area and any impacts to the site should be avoided.

There is one camp located on the western bank of John the Fool Bayou near the base of Plum Point.

4.3.2 Economics

Wetlands surrounding Little Lake have great value as forage, cover, and nursery habitat for the diverse and abundant assemblage of finfish and invertebrates that are harvested by Louisiana's commercial and recreational fishermen. Louisiana contains more than 40 percent of the U.S. tidal marshes and supports the largest commercial fishery in the lower 48 states (Breaux Act Newsflash, 2003). About 90 percent of the fish harvested from the Gulf of Mexico rely on aquatic habitats such as those found around Little Lake (Coreil, 2000).

Located southwest of Little Lake, the statistically combined fishing port of Golden Meadow-Leeville ranked among the top ports in the United States for both 2000 and 2001 in quantity and value of fishery landings. In 2001, this area landed 24.1 million pounds (32^{nd}) with a value of $36.9 million ($12^{th}$). This was down from the previous year of 26.9 million pounds valued at $44.9 million. Other ports in the Barataria-Terrebonne Basin ranked in the top 60 ports nationally for 2001 are Empire-Venus (third in pounds and sixth in value), Dulac-Chauvin (22^{nd} in pounds and fourth in value) and Grand Isle (52^{nd} in value) (Holliday and O'Bannon, 2002).

In addition to the economic impact from the commercial fishing industry, revenue is generated from recreational wildlife and fisheries activities on

or near Little Lake. Other sources of revenue are fur trapping, waterfowl hunting, and alligator harvest in the vicinity of Little Lake, and oil and gas production.

4.3.3 Land Use

Present and historical land use in the project area is restricted to fish and wildlife resource management and harvest. Access is only by boat. There is one camp located near John the Fool Bayou. There is oil and gas production in Little Lake and in marshes west and south of the project area. Various sized recreational and service boats for the petroleum industry use Little Lake.

4.3.4 Recreation

Since the project area is accessible only by boat, recreational activities are limited to fishing, trapping, hunting and perhaps bird watching. Marshes in the project area are not conducive to camping or hiking.

4.3.5 Noise

Little Lake is a state-owned water bottom in a remote area that has no industry other than oil and gas production. Ambient noise in the area would result from petroleum exploration and production, boats, or wildlife.

4.3.6 Infrastructure

Pipelines and flowlines comprise the only infrastructure near the project area.

5.0 ENVIRONMENTAL CONSEQUENCES

The long-term resource benefits of the project derive primarily from preventing shoreline erosion along 25,000 feet of the Little Lake shoreline, creating 551 acres of marsh, nourishing 406 acres and reducing the rate of marsh loss by 50 percent over the 20-year life of the project. Increases in acreage and longevity of marsh will provide natural resource benefits by increasing the abundance and quality of foraging and cover habitat for numerous wetland and estuarine fish and wildlife species.

Without the project, existing environmental conditions would continue to deteriorate. Shorelines would continue to erode between 20 and 40 feet per year or even greater as the lake lip disappears and wave fetch increases. The fragile vegetated areas would convert to open water due to subsidence and increased hydrological forces.

5.1 Physical Environment

5.1.1 Geology, Soils and Topography

Geology of the area would not be affected either with or without the project. With the project, soils in the marsh and open water areas of Area A would be replaced or enhanced with similar material dredged from Little Lake. Soils in the remainder of the area would not be affected with or without the project. The rock dike would establish a man-made shoreline or breakwater with an elevation of +2.5 feet. Post-construction monitoring of shoreline protection projects generally shows a progradation of land as compared to continued loss in areas not protected (Sweeney, 2001).

Topography would gradually change without the project as marsh converts to open water. With the project, the topography of the marsh would be altered by disposal of dedicated dredged materials in 551 acres of open water areas to create a maximum elevation of approximately +2.1 feet. Dredged material also would be added to approximately 406 acres of existing marsh so that the resultant elevation also would be +2 feet. Some containment dikes might remain somewhat higher than the filled areas, but would be degraded or breached to ensure adequate circulation and drainage as soon as the fill material consolidated. The loss rate of created or nourished marsh plus the stability of the shoreline protection has been predicted to be 50 percent of unprotected and unnourished areas.

5.1.2 Climate and Weather

With or without the proposed project, there would be no effect on climate or weather. The shoreline protection dike would reduce wave energies caused by wind-driven currents.

5.1.3 Air Quality

There would be no change in air quality without the project. Minor temporary adverse impacts would result from the proposed construction activities. Exhaust emissions with airborne pollutants from dredging equipment or service boats should be quickly dissipated by prevailing winds and would be limited to the construction phase of the project. There would be no long-term adverse impacts to air quality.

5.1.4 Surface Water Resources

There would be no change in surface water resources without the project. Dredging, either for access or mining for discharge materials, and spoil

placement, whether adjacent to the channels or for marsh creation and nourishment, would increase turbidity in the lake and marsh during the period of construction. Construction activities of the rock dike and containment dikes also would increase turbidity, temporarily. After construction is completed, however, the rock dike would reduce currents from Little Lake, therefore, turbidity between the dike and existing shoreline should be reduced. As the waters became calmer between the dike and shoreline, sediments would settle out and some accretion may occur. Clearer and less turbulent water is conducive to sunlight penetration and the growth of submerged aquatic plants. Long-term impacts to surface water resources would be slightly beneficial.

5.2 Biological Environment

5.2.1 Vegetative Communities

The No Action Alternative would allow continued shoreline retreat and deterioration of the fragile interior marsh. In FWOP, the WVA predicted a loss rate of emergent marsh of 1.785 percent per year and a shoreline retreat of 20 feet per year for Area A. The shorelines of Areas B and C are predicted to continue to erode 40 feet per year, however no land loss rate was applied for FWP or FWOP scenarios. There would be a decrease in emergent marsh of 185, 56, and 132 acres, respectively, for Areas A, B, and C by TY20 or a total loss of 203 acres without the project.

The project initially would nourish over 400 acres of existing marsh and create over 550 acres of marsh elevations in open water areas. FWP predictions for TY20 in the marsh creation and nourishment areas are 336 acres of emergent marsh in Area A, 59 acres in Area B, and 206 acres in Area C for a total of 601 acres.

Marsh nourishment (depositing a thin layer of dredged material onto deteriorated marshes) is a relatively new technique applied to coastal restoration. Several studies have investigated plant response and survivability in an elevated environment in both deteriorated and non-deteriorated marshes (Wilsey et al., 1992; Leonard et al., 1999-2000). Adding a layer of dredged material to deteriorated marshes increases vascular plant stem densities, above and below ground biomass, and oxygen levels, and has no notable negative effect on benthic diversity or abundance (Wilsey et al., 1992; Leonard et al., 1999-2000). Pilot studies conducted by the USACE (1993) found that the rate of re-vegetation after marsh nourishment is largely related to the thickness of disposed material. Thick layers of nourished marsh can take up to two growing seasons to vegetate to baseline conditions because the layer is too deep to allow rhizome growth. Thick layer nourishment typically re-vegetates according the seed bank available in the disposed sediment. Thinner layers can re-

vegetate faster because buried plants are able to recover and re-vegetate by rhizome (U.S. Army Corps of Engineers, 1993).

The maximum depth of marsh nourishment as part of the Little Lake project is approximately 0.92 foot. This depth will vary according to existing marsh elevation throughout the project area. When subsidence, dewatering, shrinkage and compaction are considered, it is reasonable to anticipate an approximately 50 percent decrease in elevation of the newly deposited dredged material (U.S. Army Corps of Engineers, 1993). This loss in elevation should allow the nourished marsh to be at a more optimum target elevation for wetland plant productivity.

Vegetative plantings of the species dominant to the area would supplement places where local vegetation was sparse or insufficient to help stabilize the area. The colonization of planted areas, as well as increased vegetative growth in the nourished areas, would help reduce erosion since well established root biomass holds soil in place.

There would be no change in the percentage (10 percent) of SAV (without the project. The project is expected to slightly increase SAV abundance (15 percent) due to calmer, less turbulent waters behind the breakwater and throughout the open water areas within the project area.

5.2.2 Essential Fish Habitat

The proposed action is designed to create and nourish coastal marsh habitat and reduce shoreline erosion in the southwestern portion of Little Lake. Projects like this are recommended in the 1998 generic amendment of FMPs for the Gulf of Mexico. The Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake project will help to ensure the long-term sustainability of important habitats and the managed species that depend on those habitats during some stage in their life cycle. While certain categories of EFH would be adversely impacted by project implementation, those impacts would be offset by the protection and restoration of more productive categories of EFH, such as marsh. The need for restorative action in this area was recognized in 2001 and the Little Lake project was selected by a public process that offered opportunity for public input and debate prior to funding through the CWPPRA process.

In the long term, with no further protective measures and continual tidal exchange, the current rate of land loss is expected to continue or even accelerate. The proposed activities would improve EFHs by creating and enhancing marsh in Area A and protecting existing marsh in Areas B and C. Over 950 acres of marsh habitat would be created or nourished by completion of the project. The continued existence of marsh vegetation up to and after target year 20 would ensure more beneficial habitat than open

water. Marsh edge has been shown to support higher densities of transient species such as penaeid shrimps and blue crabs. (Minello and Rozas, 2002). Marsh vegetation supports higher standing crops of most fishery species compared with shallow marsh ponds of similar size (Rozas and Minello, 2001). With completion of the project, vegetated marsh would replace less productive forms of EFH in the Little Lake area. Improved hydrologic conditions (i.e., the shoreline protection dike and created or nourished marsh) should reduce water levels and the rate of land loss. Detrital material, formed by the breakdown of emergent vegetation, would contribute to the aquatic food web of Little Lake and the Barataria Estuary.

Short-term adverse impacts to aquatic organisms would occur during the construction phase of the project. Other temporary impacts might include entrapment of slow-moving organisms during dedicated dredging and increased turbidity in waters near dredging and construction sites. These impacts are minor and would be limited to the immediate vicinity of action and only for the duration of dredging and dike construction.

5.2.3 Fishery Resources

Continued degradation of the marsh and rapid shoreline retreat will directly affect the productivity of the project area if no action is taken. Some short-term impacts, such as increased turbidity and suspended solids during construction and localized destruction of non-motile benthic organisms and their habitat would occur.

Behind the shoreline protection dike, the 550 acres created and 406 acres nourished are expected to provide high quality fishery habitat beyond the 20-year target life of the project. By slowing the loss of marsh and increasing SAV, the project will protect and extend the quality of the Round Lake area to support estuarine-dependent fishery resources. Ingress and egress through the fish gaps should not limit access to the nursery area provided by vegetated marsh. Long-term impacts would be beneficial.

The lake bottom in the borrow area eventually would support normal flora and fauna of estuarine lakes and would continue the functions of open water habitat. The rock dike would provide substrate for sessile and attached organisms that could be a food source for some predators. Thus, there would be no long-term adverse impacts to the lake.

5.2.4 Wildlife Resources

Without the project, habitat for wildlife resources would continue to decline, since the loss of vegetation reduces the quantity and quality of marsh as habitat for terrestrial and semi-aquatic wildlife. Short-term

adverse impacts in the area of construction would occur to slow-moving or sedentary organisms.

With the project, loss of emergent marsh would be reduced and the project area would continue to provide suitable habitat for the wildlife resources that presently utilize the area. With the Davis Pond Diversion in operation, salinities may eventually drop enough that the entire project area would be classified as intermediate and thus be more attractive to a greater number of species. Resident or migratory populations should return to normal after construction is completed, therefore no long-term adverse impacts would be anticipated.

Executive Order 13186 of January 2001 mandates that all Federal agencies incorporate the protection of migratory bird habitat in all planning efforts. Continued deterioration of herbaceous areas within the project would be expected under the no action scenario. Implementation of the project would slow or reverse land loss, and create and nourish emergent wetlands. Perhaps a small amount of woody vegetation would become established on the retaining dikes, thus enhancing an area suitable for migratory avian species.

5.2.5 Threatened and Endangered Species

The proposed project is not likely to adversely affect listed threatened and endangered species or their critical habitats.

5.3 Cultural Environment

5.3.1 Historical or Archeological Resources

The National Register of Historic Places has a record of one site in the project area that is located near John the Fool Bayou. There are no plans for activity at this location; however, it should be somewhat more protected because of construction of the rock dike. Procedures required under Section 106 of the National Historic Preservation Act will be followed to insure this and any cultural resource discovered during construction will be preserved.

5.3.2 Economics

No adverse impacts to economic resources would result from the proposed activity. Project construction would provide temporary employment. The continued productivity of the area would contribute to sustaining the seafood industry and fur production, as well as provide limited protection to oil and gas infrastructure.

5.3.3 Land Use

No negative impacts to current land use would result from the proposed activity in the marshes around Little Lake. An increase in the harvest of furbearers and alligators may result from the increase in supporting habitat. Human access to marshes may require a longer route to circumvent the rock dike. Positive impacts would be the creation of 550 acres and nourishment of 406 acres of marsh and the reduced rate of marsh loss.

5.3.4 Recreation

Some temporary adverse short-term impacts to recreation would occur (i.e., increased turbidity of surface water) as a result of dredging activity. However, the long-term impact of additional wetlands, shoreline protection and reduced land loss rates would far out-weigh any negative impacts. These long-term impacts would provide continued opportunities for sport fishers and hunters.

5.3.5 Noise

Short-term adverse impacts, limited to the construction phase, include increased noise associated with supply boats and dredging machinery. There would be no long-term adverse impacts.

5.3.6 Infrastructure

Without the project, erosion would continue and the pipelines and flowlines within the project area would be subjected to increased tidal action. The rock dike will cross the Tennessee Gas Pipeline, thus preventing boat traffic from entering the canal directly from Little Lake, however there is an alternate route into the canal. Protection of the project area marshes from shoreline erosion and extended marsh viability due to creation and nourishment would benefit the area. A longer-lived marsh in the Round Lake area would provide limited protection to buried pipelines in oil and gas fields outside the project area. There would be no long-term adverse impacts to infrastructure.

6.0 CONCLUSIONS

This Environmental Assessment finds that no significant adverse environmental impacts are anticipated by implementation of the Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake project. This CWPPRA wetland restoration project would use dedicated dredged materials to create 551 acres and enhance an additional 406 acres of marsh in an area that has sustained extensive marsh loss in the last decades. This project also would construct 25,000 feet of shoreline protection along the southwestern shore of Little Lake in an area that has retreated between 20 and 40 feet per year. Design

of the rock dike would allow ingress and egress for marine organisms and provide for adequate drainage of marsh areas. Construction of the project is estimated to reduce the land loss rate for the project area by 50 percent. The conclusion is based on a comprehensive review of relevant literature, site-specific data, and project-specific engineering. This finding supports the recommendation of the CWPPRA Task Force, including NMFS, the sponsoring agency. The natural resource benefits anticipated from implementation of Little Lake Shoreline Protection/Dedicated Dredging near Round Lake are expected to protect, enhance, and sustain the diverse ecosystem of Barataria Bay and to reduce coastal wetland loss within the project area.

7.0 ENVIRONMENTAL JUSTICE

Executive Order 12898 (Environmental Justice) requires "to the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low income populations...". The proposed Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake project has been reviewed for compliance with this order and it has been determined that the preferred alternative would not adversely affect the health or environment of the human population regardless of race or economic status.

8.0 CUMULATIVE EFFECTS

There is one multi-phase CWPPRA project partially completed in wetlands around the perimeter of Little Lake. Phases 1, 2 and 3 of BA-27 Barataria Basin Landbridge Shoreline Protection Project have been completed and other phases are expected to be completed in the next several years. The USACE project of freshwater diversion at Davis Pond will indirectly affect the project area by somewhat reducing salinities in Little Lake. Completion of the proposed Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake project and BA 27 in the vicinity of Little Lake would not have a significant cumulative effect on the quality of the human environment.

9.0 PREPARERS

This EA was prepared by GOTECH, Inc. under contract to NMFS. Under the direction and guidance of NMFS personnel Dr. John Foret, NMFS NEPA Coordinator for CWPPRA; and Mrs. Cheryl Brodnax, Project Manager; and Mr. Bruce Dyson of GOTECH, Inc.; Ms. Peggy A. Mobley wrote the Environmental Assessment. Figures were prepared by GOTECH, Inc. In addition to Dr. Foret and Mrs. Brodnax, Mr. Patrick Williams and Ms. Rachel Sweeney, also of NMFS, Mr. Gerald Bodin of FWS, and Mr. Clark Allen of LDNR provided reference materials and assistance. Dr. Erik Zobrist and

Mr. Richard Hartman of NMFS reviewed the first draft and made helpful suggestions, as did Dr. Foret and Mrs. Brodnax.

10.0 FINDING OF NO SIGNIFICANT IMPACT (FONSI)

Based on the conclusion of this document and the available information relative to Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake (BA-37) project, including geotechnical investigations, there would be no significant environmental impacts from this action. Furthermore, the National Environmental Policy Act or its implementing regulations do not require preparation of an Environmental Impact Statement on this project.

Rebecca Lent for

William T. Hogarth, Ph.D.
Assistant Administrator for Fisheries
National Marine Fisheries Service

11/25/03
Date

11.0 LITERATURE CITED

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LITTLE LAKE

for

National Marine Fisheries Service
N.O.A.A.
U.S. Department of Commerce

GRAPHIC SCALE
100,000 0 100,000
(IN FEET)
1 inch = 100,000 ft.

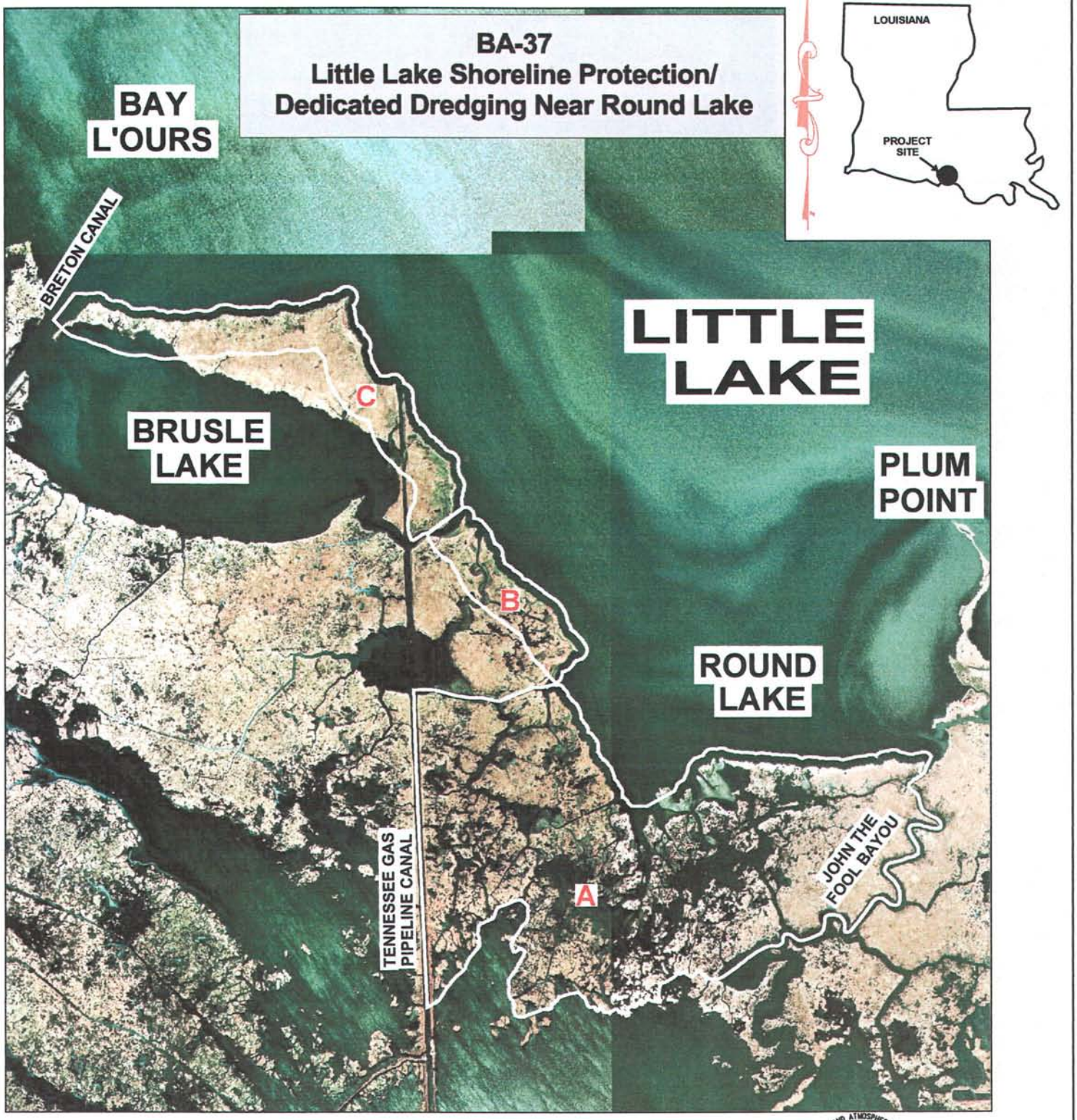
VICINITY MAP

FIGURE 1

G O T E C H , I N C .

CONSULTING ENGINEERS 8383 BLUEBONNET BLVD. BATON ROUGE, LA. 70810

Date: MAY, 2003	Job No.: 275\Permit Little_Lake\dwg_data	File: FIGURE 1	
Approved By: BKD	Checked By: BKD	Drawn By: DAB	



LITTLE LAKE

for

National Marine Fisheries Service
N.O.A.A.
U.S. Department of Commerce

GRAPHIC SCALE
3,000 0 3,000
(IN FEET)
1 inch = 3,000 ft.

AREA MAP

FIGURE 2

GOTECH, INC.
CONSULTING ENGINEERS 8383 BLUEBONNET BLVD. BATON ROUGE, LA. 70810

Date: MAY, 2003	Job No.: 273\Permit Little_Lake\dwg_data	File:	FIGURE 2
Approved By: BKD	Checked By: BKD	Drawn By:	DAB

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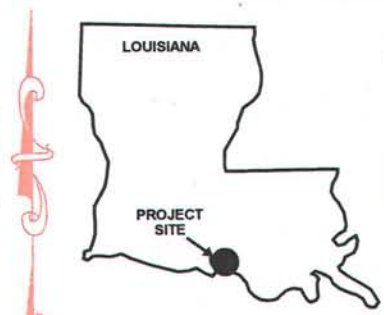
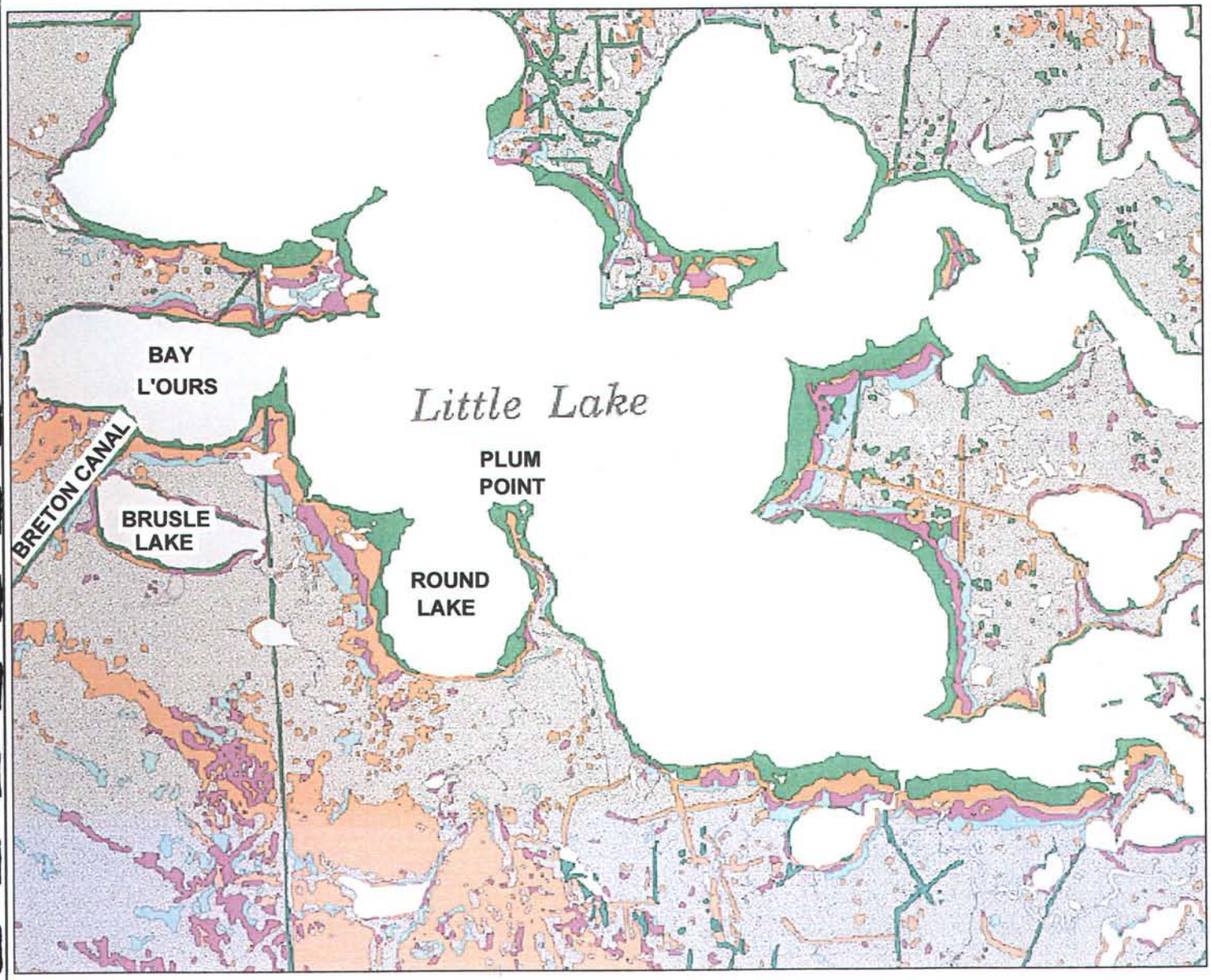




Legend

- Time 1: 1930's to 1956-58
- Time 2: 1956-58 to 1974
- Time 3: 1974 to 1983
- Time 4: 1983 to 1990

GRAPHIC SCALE

6,000 0 6,000

(IN FEET)

1 inch =6,000 ft.

LITTLE LAKE

for

National Marine Fisheries Service
N.O.A.A.
U.S. Department of Commerce

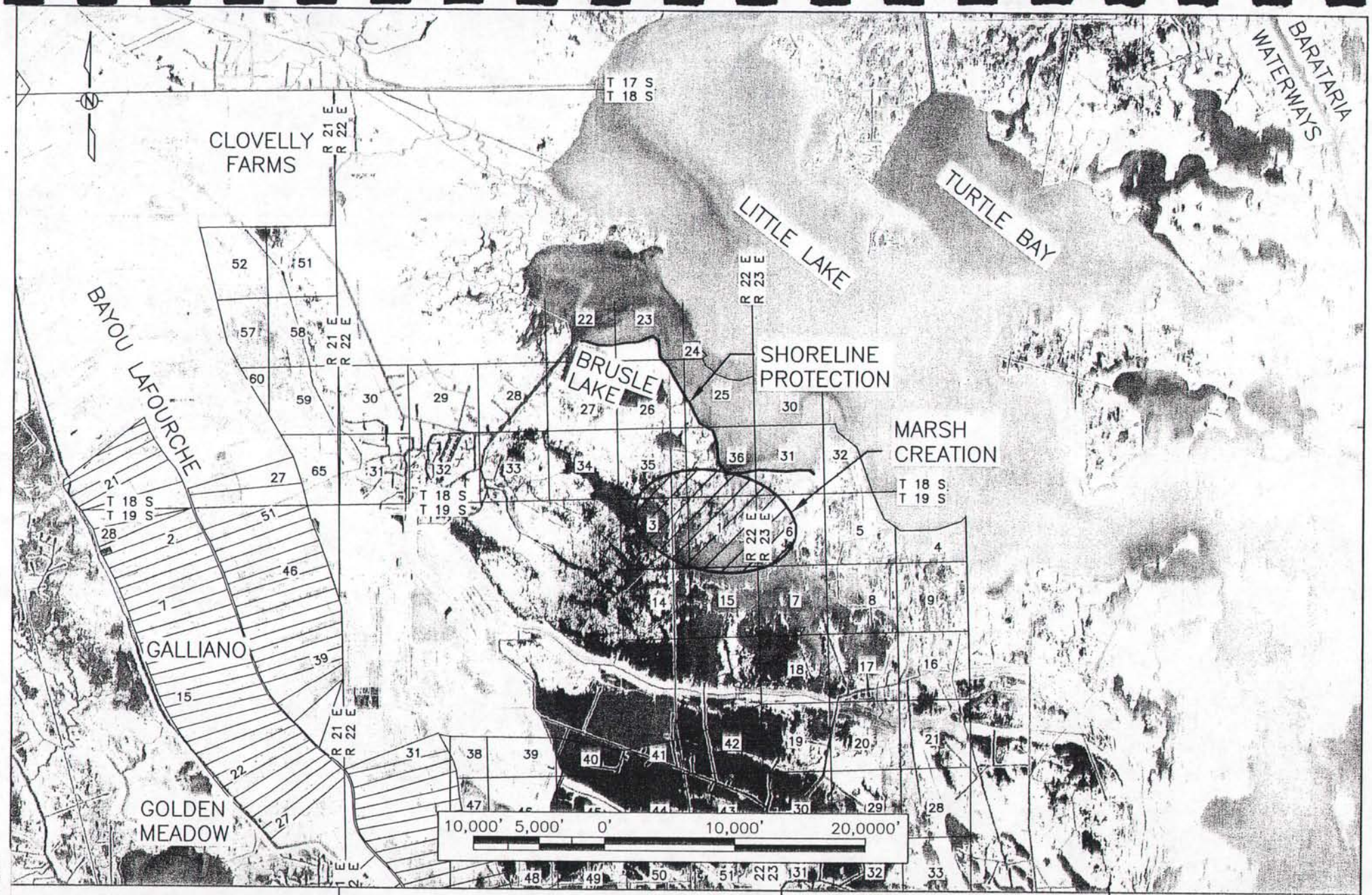
AREA MAP

FIGURE 3

GOTECH, INC.

CONSULTING ENGINEERS 8383 BLUEBONNET BLVD. BATON ROUGE, LA. 70810

Date: MAY, 2003	Job No.: 275\Permit Little_Lake\plng_data	File: FIGURE 3
Approved By: BKD	Checked By: BKD	Drawn By: SSP



APPLICATION BY:

National Marine Fisheries Service
South Stadium Road, Military Science Room 266
Baton Rouge, LA 70803-7535

LOUISIANA DEPARTMENT OF NATURAL RESOURCES
COASTAL RESTORATION DIVISION

617 NORTH 3RD STREET
BATON ROUGE, LOUISIANA 70802

LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION

VICINITY MAP

STATE PROJECT NUMBER: BA-37

DATE: 9/23/03

DRAWN BY: KRISTI CANTU

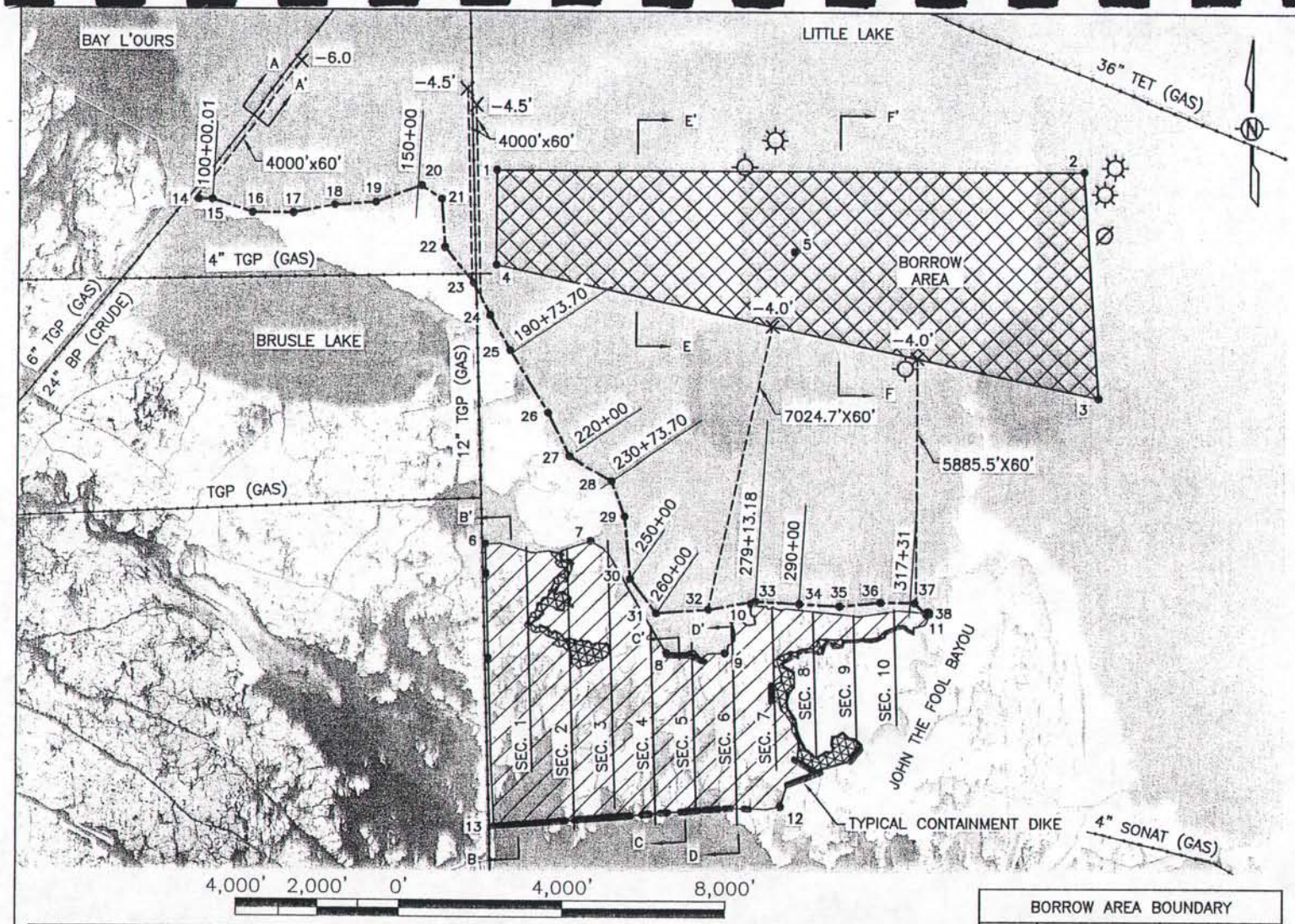
DESIGNED BY: CLARK ALLEN, P. E.

APPROVED BY: CHRIS KNOTTS, P. E.

FEDERAL PROJECT NUMBER: BA-37

SHEET 1 OF 23

Figure 4



MARSH CREATION AREA BOUNDARY		
PT.	LATITUDE	LONGITUDE
6	29.4769	90.1964
7	29.4771	90.1884
8	29.4694	90.1826
9	29.4694	90.1780
10	29.4728	90.1761
11	29.4721	90.1623
12	29.4588	90.1738
13	29.4577	90.1959

SHORELINE PROTECTION CENTERLINE		
PT.	LATITUDE	LONGITUDE
14	29.5004	90.2185
15	29.5004	90.2174
16	29.4995	90.2143
17	29.4994	90.2112
18	29.4999	90.2080
19	29.5001	90.2048
20	29.5013	90.2013
21	29.5003	90.1997
22	29.4971	90.1995
23	29.4947	90.1973
24	29.4925	90.1960
25	29.4901	90.1945
26	29.4858	90.1916
27	29.4828	90.1900
28	29.4812	90.1867
29	29.4788	90.1857
30	29.4745	90.1853
31	29.4722	90.1833
32	29.4724	90.1793
33	29.4730	90.1757
34	29.4728	90.1723
35	29.4726	90.1691
36	29.4728	90.1660
37	29.4728	90.1633
38	29.4720	90.1624

LEGEND

- BORROW AREA
- MARSH CREATION
- MAX. FILL ELEV.=0.33' NAVD 88
- P&A DRY WELL
- ACTIVE WELL
- Ø P&A WELL
- SHORELINE PROTECTION
- CONTAINMENT DIKE
- PIPELINE
- ACCESS TO FLOATATION CHANNEL
- X ELEV. (END OF ACCESS)

BP BRITISH PETROLEUM
TGP TENNESSEE GAS PIPELINE
TET TEXAS EASTERN TRANSMISSION CORP.
SONAT SOUTHERN NATURAL GAS CO.

BORROW AREA BOUNDARY		
PT.	LATITUDE	LONGITUDE
1	29.5023	90.1955
2	29.5019	90.1501
3	29.4865	90.1490
4	29.4959	90.1956
5	29.4967	90.1725

APPLICATION BY:
National Marine Fisheries Service
South Stadium Road, Military Science Room 266
Baton Rouge, LA 70803-7535

LOUISIANA DEPARTMENT OF NATURAL RESOURCES
COASTAL RESTORATION DIVISION
617 NORTH 3RD STREET
BATON ROUGE, LOUISIANA 70802

LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION

PROJECT LOCATION

STATE PROJECT NUMBER: BA-37

DATE: 9/23/03

DRAWN BY: KRISTI CANTU

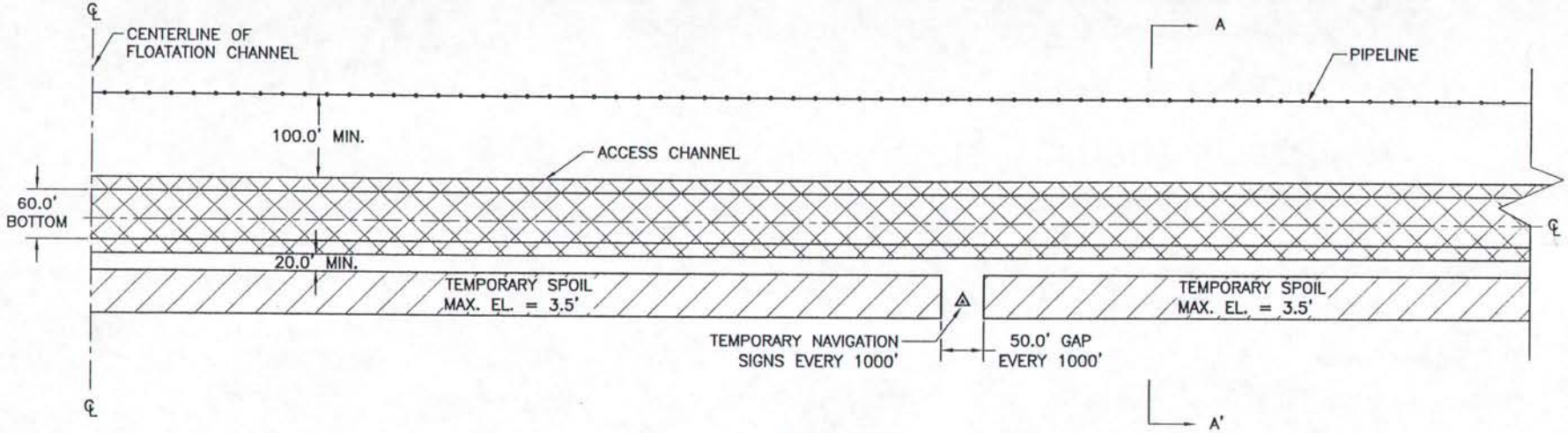
DESIGNED BY: CLARK ALLEN, P. E.

APPROVED BY: CHRIS KNOTTS, P. E.

FEDERAL PROJECT NUMBER: BA-37

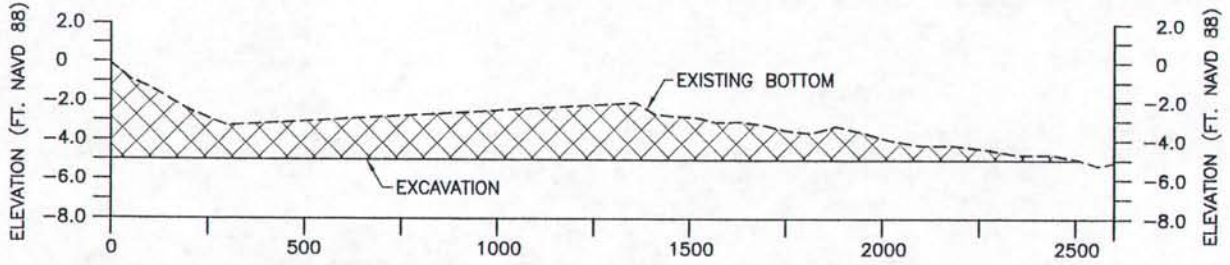
SHEET 2 OF 23

Figure 5



PLAN VIEW
ACCESS CHANNEL

200' 100' 0' 200' 400'



PROFILE
ACCESS CHANNEL
STA 290+00

NOTES:
1. SPOIL WITHIN THE TEMPORARY STOCKPILE AREA SHALL BE BACK FILLED INTO CHANNEL PRIOR TO PROJECT COMPLETION LEAVING THE LAKE BOTTOM WITHIN ±0.5' OF THE PRE CONSTRUCTION ELEVATIONS.
2. SEE SHEET 4 FOR TYPICAL SECTION A–A'.
3. NO DREDGING ALLOWED OUTSIDE OF THE BORROW AREA, FLOATATION, AND ACCESS CHANNEL.
4. NO PORTION OF ANY EQUIPMENT OR VESSEL SHALL CONTACT THE WATER BOTTOM DURING TRANSIT TO AND FROM PROJECT SITE.
5. SEE SHEETS 11–16 FOR LOCATIONS OF TEMPORARY SPOIL.

HORIZONTAL GRAPHIC SCALE

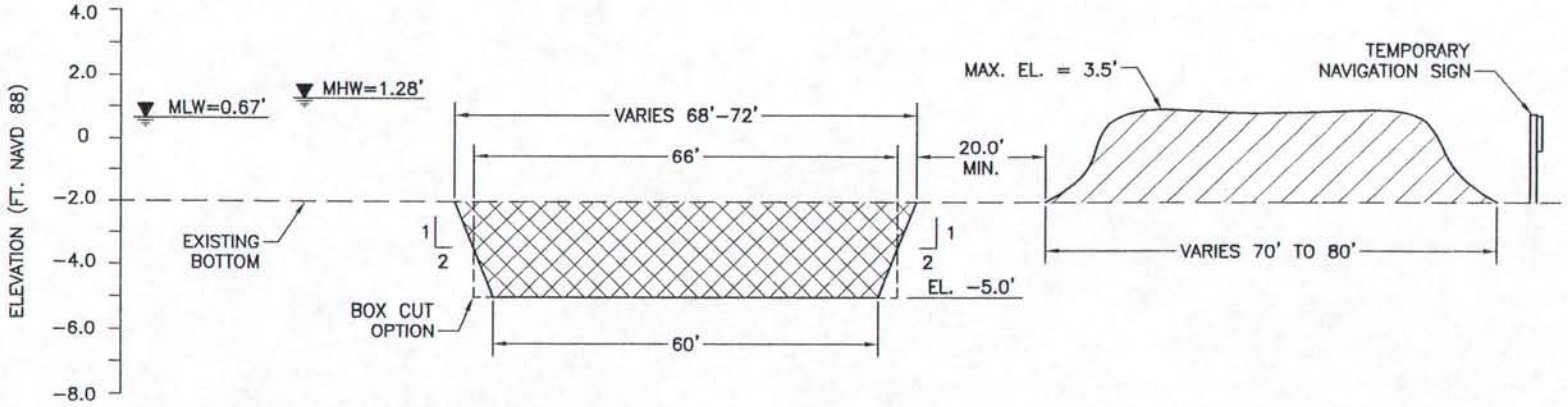
500' 250' 0 500' 1000' 1500'

10' 5' 0 10' 20' 30'

VERTICAL GRAPHIC SCALE

APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803–7535	LOUISIANA DEPARTMENT OF NATURAL RESOURCES COASTAL RESTORATION DIVISION 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802		LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	TYPICAL ACCESS CHANNEL PLAN AND PROFILE VIEWS
			STATE PROJECT NUMBER: BA–37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P. E.	APPROVED BY: CHRIS KNOTTS, P. E.	FEDERAL PROJECT NUMBER: BA–37	SHEET 3 OF 23

Figure 6



SECTION A–A'
ACCESS CHANNEL

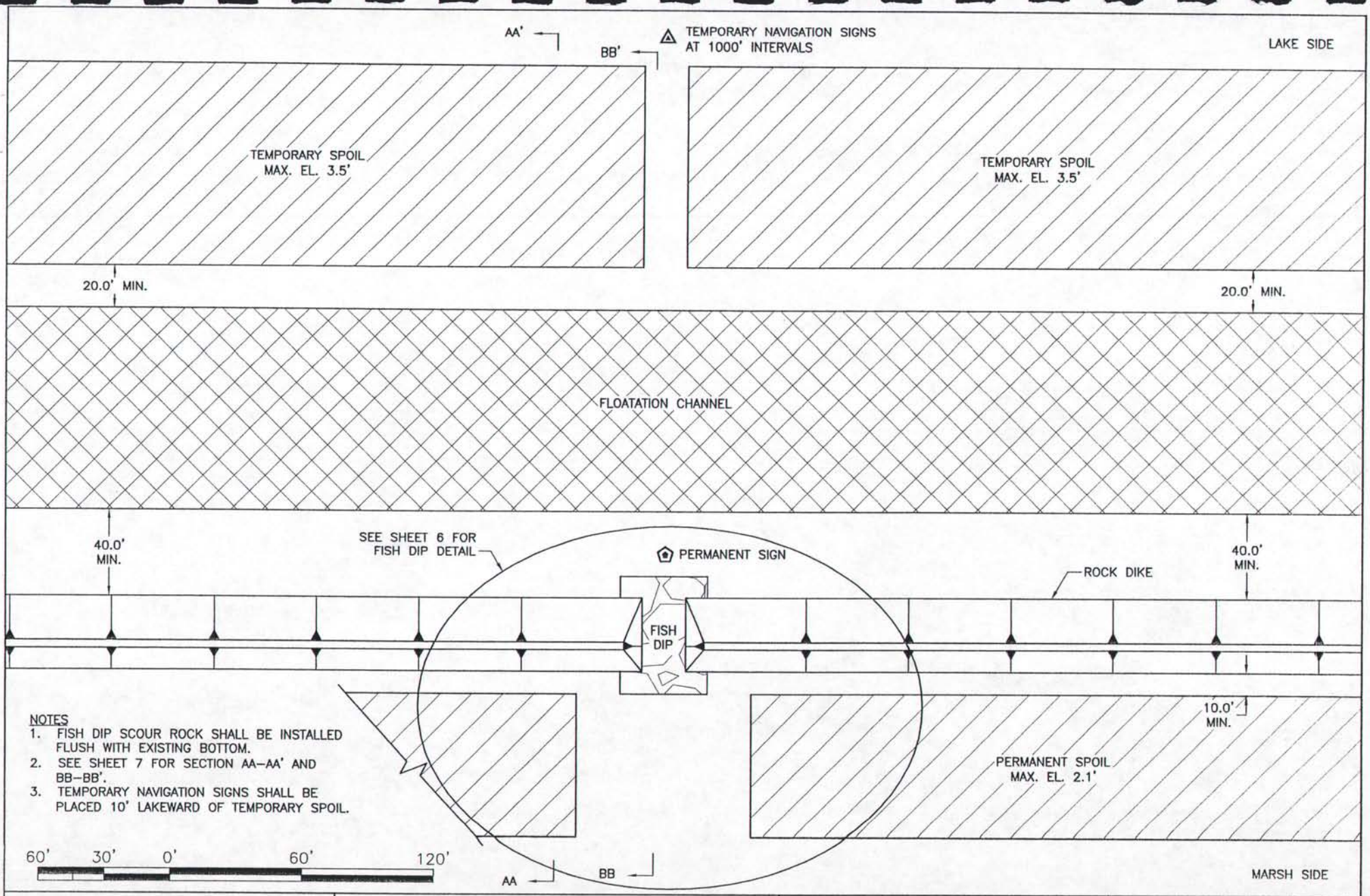
NOTES
1. ACCESS CHANNEL SIDE SLOPES WERE PROVIDED BY GEOTECHINAL CONSULTANTS.
2. SPOIL WITHIN THE TEMPORARY STOCKPILE AREA SHALL BE BACK FILLED IN CHANNEL PRIOR TO PROJECT COMPLETION LEAVING THE LAKE BOTTOM WITHIN ±0.5' OF PRE CONSTRUCTION ELEVATIONS.

HORIZONTAL GRAPHIC SCALE
30' 15' 0 30' 60' 90'
6' 3' 0 6' 12' 18'
VERTICAL GRAPHIC SCALE

LEGEND
- ACCESS CHANNEL
- TEMPORARY SPOIL

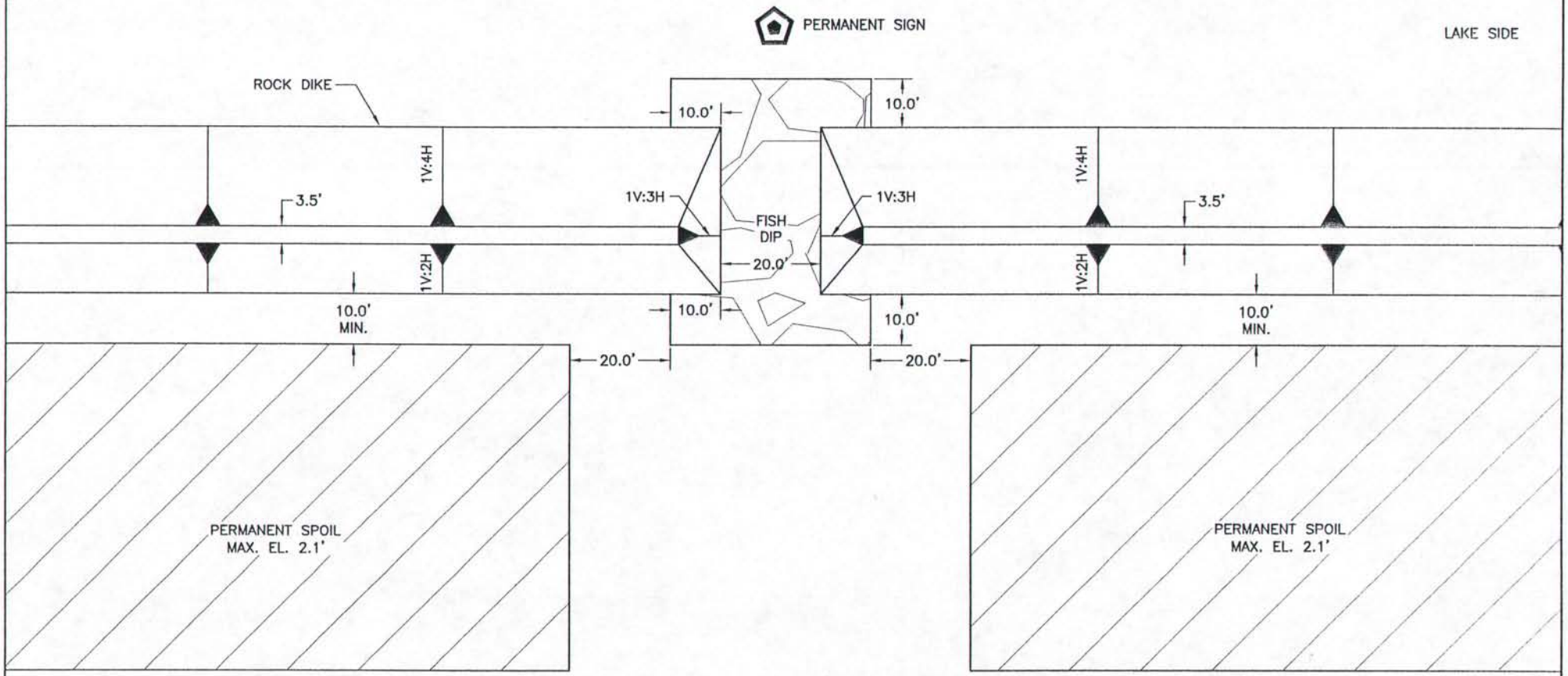
APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803-7535	LOUISIANA DEPARTMENT OF NATURAL RESOURCES COASTAL RESTORATION DIVISION 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802	LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	TYPICAL ACCESS CHANNEL SECTION
		STATE PROJECT NUMBER: BA-37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P.E. / APPROVED BY: CHRIS KNOTTS, P.E.	FEDERAL PROJECT NUMBER: BA-37	SHEET 4 OF 23

Figure 7



APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803–7535	LOUISIANA DEPARTMENT OF NATURAL RESOURCES COASTAL RESTORATION DIVISION 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802	LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	FISH DIP PLAN VIEW
		STATE PROJECT NUMBER: BA–37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P. E. / APPROVED BY: CHRIS KNOTTS, P. E.	FEDERAL PROJECT NUMBER: BA–37	SHEET 5 OF 23

Figure 8

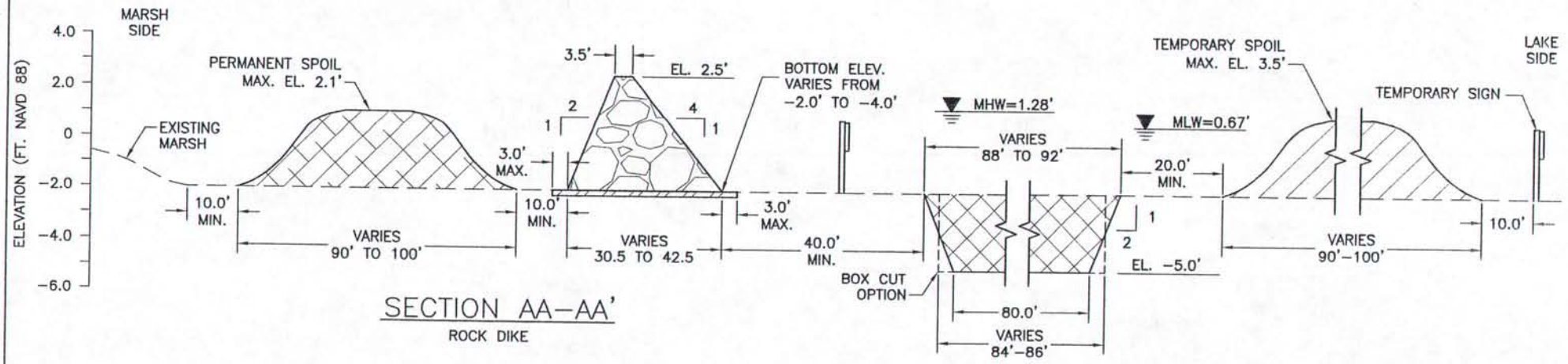


NOTES:
FISH DIP SCOUR ROCK SHALL BE INSTALLED FLUSH WITH EXISTING BOTTOM.

30' 15' 0' 30' 60'

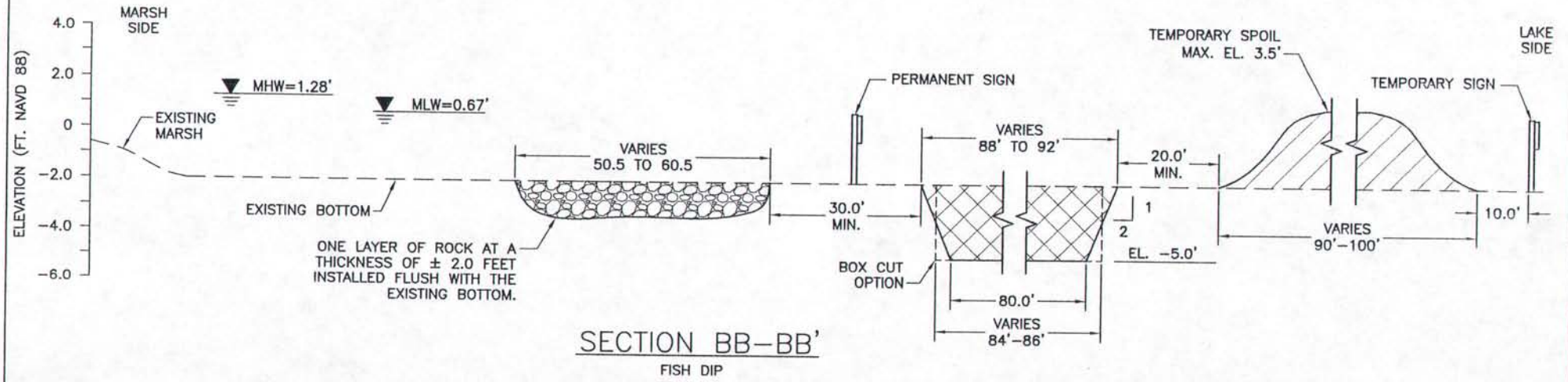
APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803-7535	LOUISIANA DEPARTMENT OF NATURAL RESOURCES COASTAL RESTORATION DIVISION 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802		LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	FISH DIP DETAIL
			STATE PROJECT NUMBER: BA-37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P. E.	APPROVED BY: CHRIS KNOTTS, P. E.	FEDERAL PROJECT NUMBER: BA-37	SHEET 6 OF 23

Figure 9



SECTION AA-AA'

ROCK DIKE

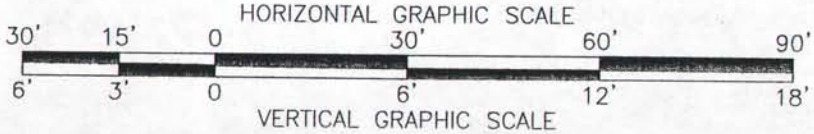


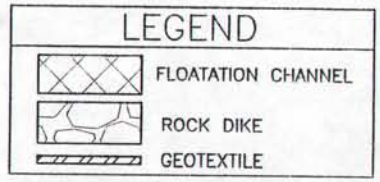
SECTION BB-BB'

FISH DIP

NOTES

1. FLOATATION SIDE SLOPES WERE GIVEN BY GEOTECHINCAL CONSULTANTS. FLOATATION WILL BE DREDGED AS A BOX CUT.
2. THE SPOIL FROM MAINTENANCE DREDGING SHALL BE PLACED ADJACENT TO THE CHANNEL.
3. SPOIL WITHIN THE TEMPORARY STOCKPILE AREA SHALL BE BACK FILLED IN CHANNEL PRIOR TO PROJECT COMPLETION LEAVING THE LAKE BOTTOM WITHIN ±0.5' OF PRE CONSTRUCTION ELEVATIONS.





APPLICATION BY:
National Marine Fisheries Service
South Stadium Road, Military Science Room 266
Baton Rouge, LA 70803-7535

LOUISIANA DEPARTMENT OF NATURAL RESOURCES
COASTAL RESTORATION DIVISION
617 NORTH 3RD STREET
BATON ROUGE, LOUISIANA 70802

LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION

TYPICAL ROCK DIKE SECTIONS

STATE PROJECT NUMBER: BA-37

DATE: 9/23/03

DRAWN BY: KRISTI CANTU

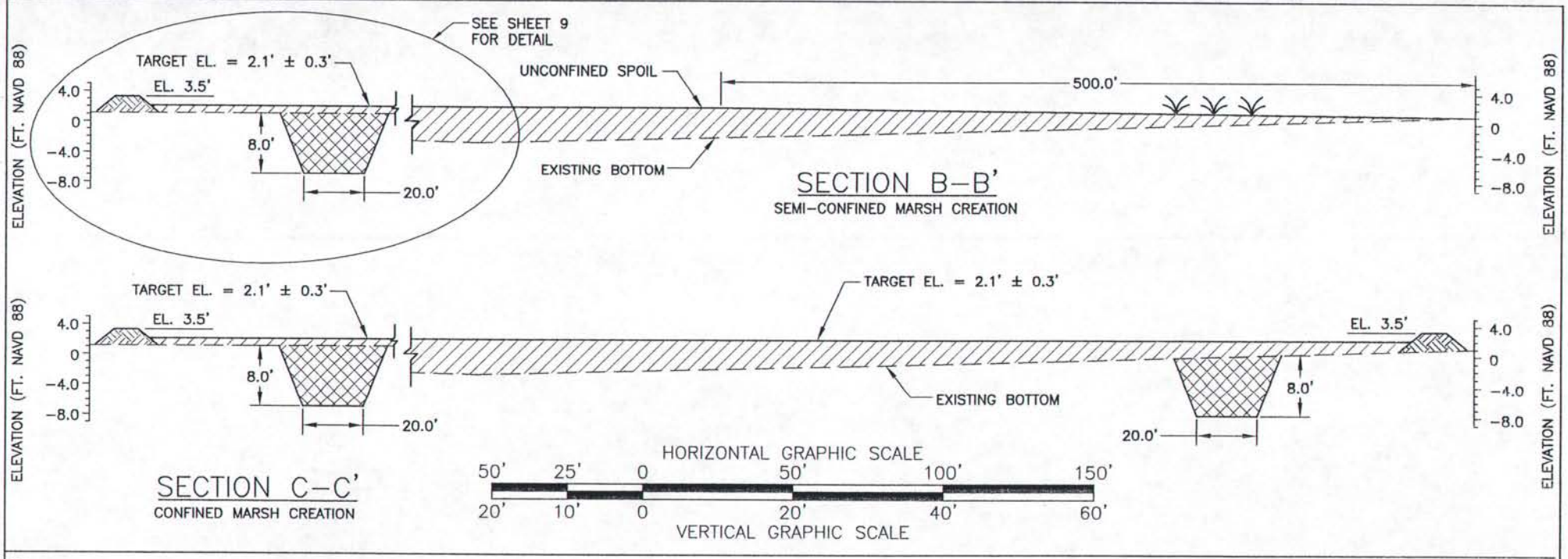
DESIGNED BY: CLARK ALLEN, P.E.

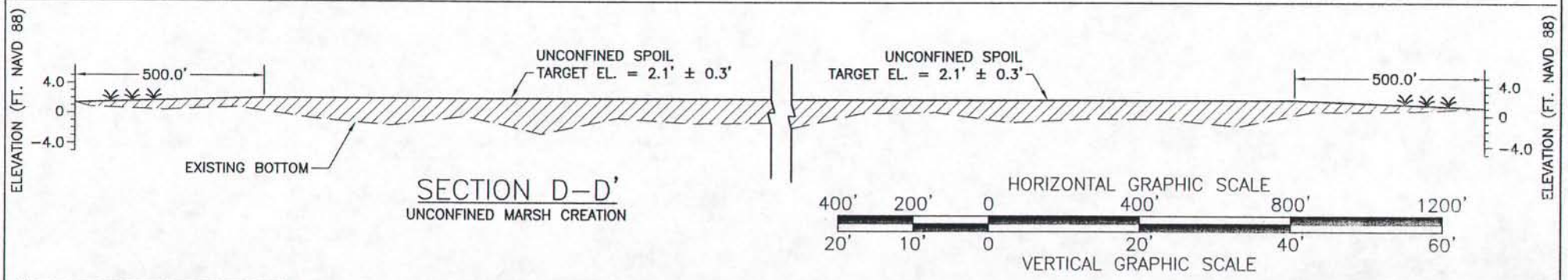
APPROVED BY: CHRIS KNOTTS, P.E.

FEDERAL PROJECT NUMBER: BA-37

SHEET 7 OF 23

Figure 10





SUMMARY OF AVERAGE MARSH ELEVATION	
PT.	AVERAGE MARSH ELEV. FT. NAVD 88
NW	1.3
CENT.	1.3
SE	1.1
AVER.	1.2

NOTES
1. DISCHARGE SHALL BE DIRECTED TO RETAIN AS MUCH MATERIAL AS POSSIBLE.
2. NO DISCHARGE POINT SHALL BE WITHIN 500' OF PROJECT BOUNDARY OR ANY BAYOU DEPICTED TO REMAIN INTERTIDAL WITHOUT PRIOR APPROVAL OF THE ENGINEER.
3. APPROXIMATELY 50,000 VEGETATIVE CONTAINERS OF SMOOTH CORDGRASS WILL BE PLANTED WITHIN THE MARSH CREATION AREA. PLANTS WILL BE NURSERY GROWN AND WILL BE MULTI–STEM. VOLUME OF PLANTINGS WITH CONTAINER SOIL IS ESTIMATED TO BE 600 CYS.

LEGEND
- EARTHEN CONTAINMENT DIKE
- CONTAINMENT DIKE BORROW
- FILL AREA

APPLICATION BY:
National Marine Fisheries Service
South Stadium Road, Military Science Room 266
Baton Rouge, LA 70803–7535

LOUISIANA DEPARTMENT OF NATURAL RESOURCES
COASTAL RESTORATION DIVISION
617 NORTH 3RD STREET
BATON ROUGE, LOUISIANA 70802

LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION

TYPICAL MARSH SECTIONS

STATE PROJECT NUMBER: BA–37

DATE: 9/23/03

DRAWN BY: KRISTI CANTU

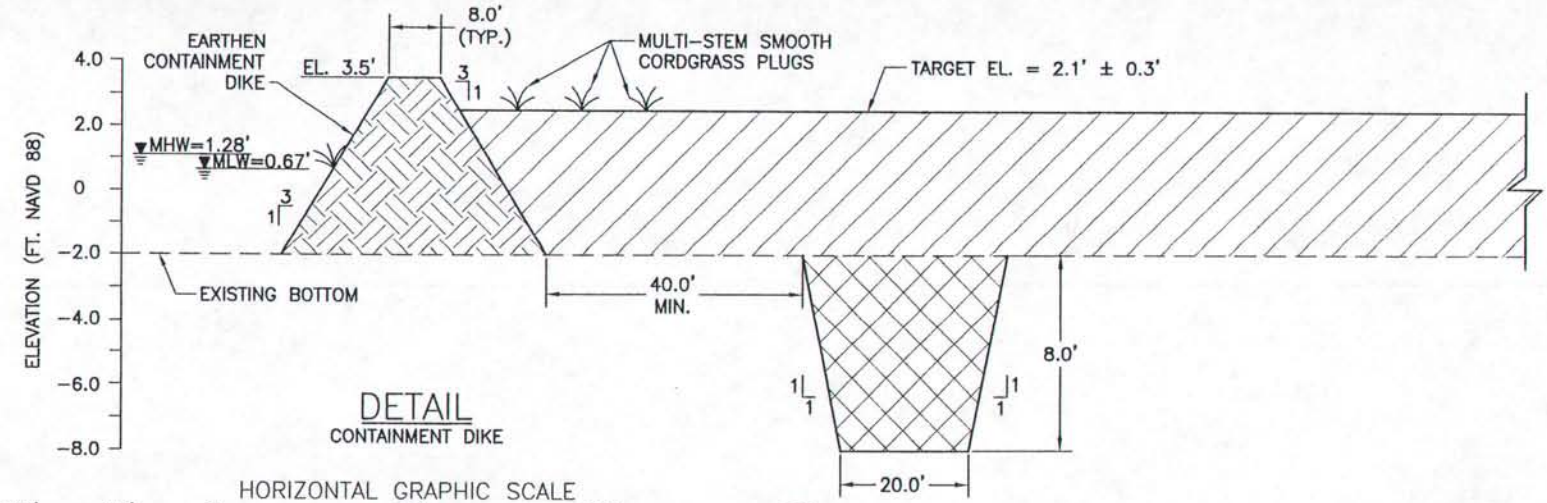
DESIGNED BY: CLARK ALLEN, P.E.

APPROVED BY: CHRIS KNOTTS, P.E.

FEDERAL PROJECT NUMBER: BA–37

SHEET 8 OF 23

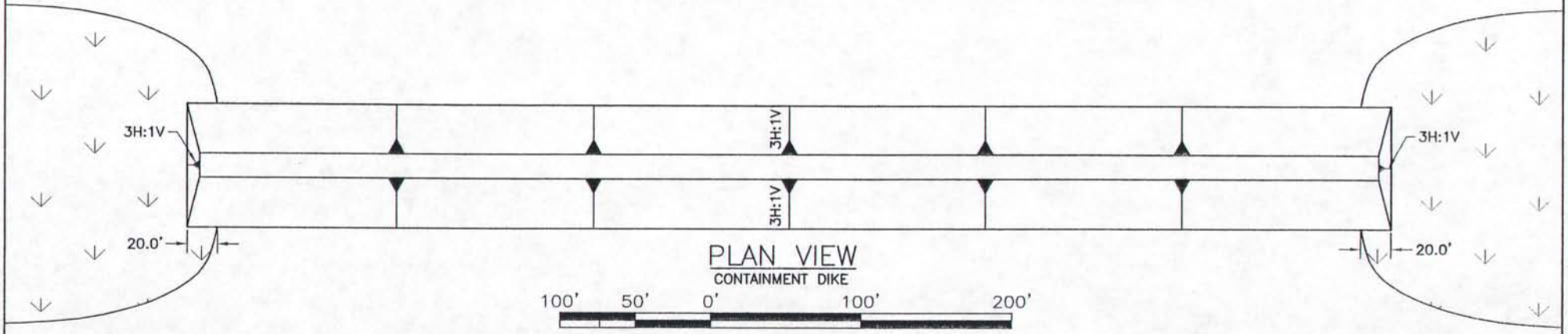
Figure 11



DETAIL
CONTAINMENT DIKE

HORIZONTAL GRAPHIC SCALE
30' 15' 0 30' 60' 90'

VERTICAL GRAPHIC SCALE
6' 3' 0 6' 12' 18'



PLAN VIEW
CONTAINMENT DIKE

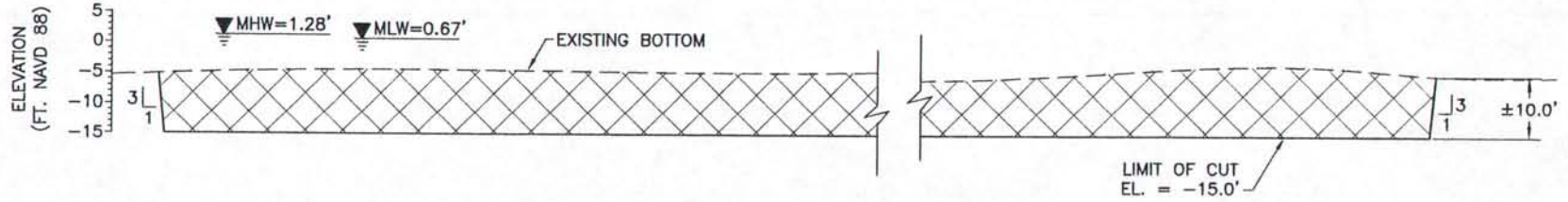
100' 50' 0' 100' 200'

NOTE:
1. APPROXIMATELY 50,000 CONTAINERS OF SMOOTH CORDGRASS WILL BE PLANTED WITHIN THE MARSH CREATION AREA.
2. PLANTS WILL BE NURSERY GROWN AND WILL BE MULTI-STEM.
3. VOLUME OF PLANTINGS WITH CONTAINER SOIL IS ESTIMATED TO BE 600 CYS.
4. CONTAINMENT DIKES WILL BE CONSTRUCTED ONLY IN OPEN WATER ALONG PROJECT BOUNDARY. INTERNAL TRAINING DIKES ARE ALLOWED PROVIDED THEY ARE NO HIGHER THAN 2.4' NAVD 88.
5. THE CONTAINMENT DIKES SHALL HAVE A 20' TIE-IN TO EXISTING MARSH AS SHOWN ABOVE.

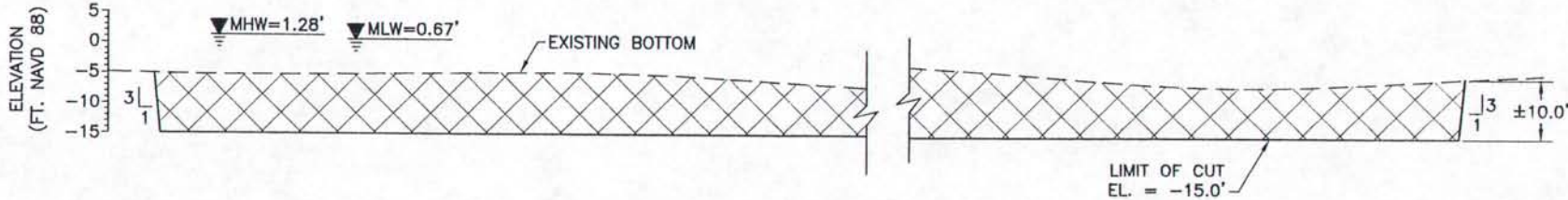
LEGEND
- EARTHEN CONTAINMENT DIKE
- CONTAINMENT DIKE BORROW
- FILL AREA

APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803-7535	LOUISIANA DEPARTMENT OF NATURAL RESOURCES COASTAL RESTORATION DIVISION 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802	LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	TYPICAL MARSH CONTAINMENT DIKE SECTION
		STATE PROJECT NUMBER: BA-37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P. E. / APPROVED BY: CHRIS KNOTTS, P. E.	FEDERAL PROJECT NUMBER: BA-37	SHEET 9 OF 23

Figure 12



SECTION E–E'
BORROW AREA



SECTION F–F'
BORROW AREA

HORIZONTAL GRAPHIC SCALE

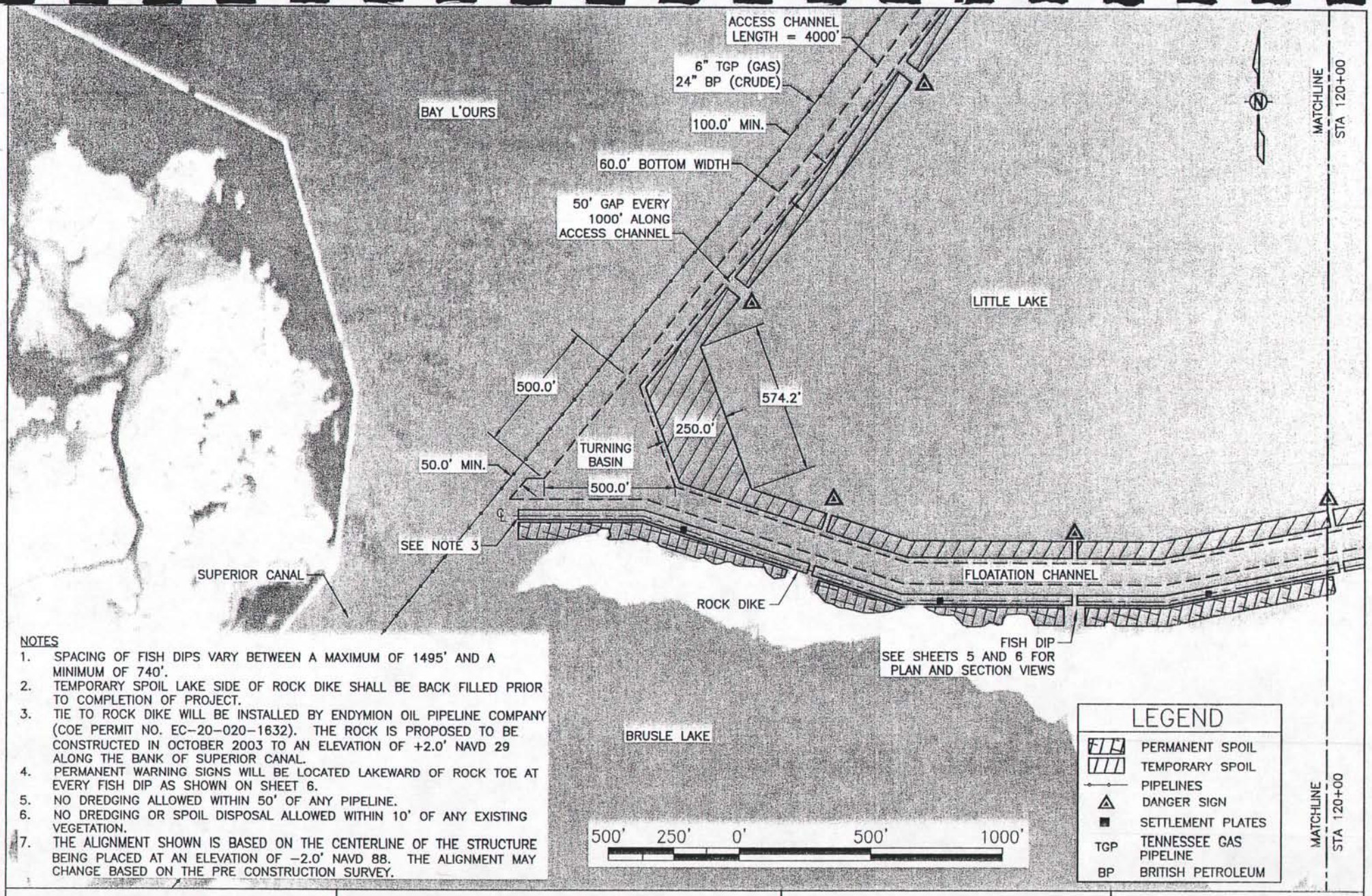
60' 30' 0 60' 120' 180'

30' 15' 0 30' 60' 90'

VERTICAL GRAPHIC SCALE

APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803–7535	LOUISIANA DEPARTMENT OF NATURAL RESOURCES COASTAL RESTORATION DIVISION 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802		LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	TYPICAL BORROW AREA SECTION
			STATE PROJECT NUMBER: BA–37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P.E.	APPROVED BY: CHRIS KNOTTS, P.E.	FEDERAL PROJECT NUMBER: BA–37	SHEET 10 OF 23

Figure 13



NOTES

1. SPACING OF FISH DIPS VARY BETWEEN A MAXIMUM OF 1495' AND A MINIMUM OF 740'.
2. TEMPORARY SPOIL LAKE SIDE OF ROCK DIKE SHALL BE BACK FILLED PRIOR TO COMPLETION OF PROJECT.
3. TIE TO ROCK DIKE WILL BE INSTALLED BY ENDYMION OIL PIPELINE COMPANY (COE PERMIT NO. EC-20-020-1632). THE ROCK IS PROPOSED TO BE CONSTRUCTED IN OCTOBER 2003 TO AN ELEVATION OF +2.0' NAVD 29 ALONG THE BANK OF SUPERIOR CANAL.
4. PERMANENT WARNING SIGNS WILL BE LOCATED LAKEWARD OF ROCK TOE AT EVERY FISH DIP AS SHOWN ON SHEET 6.
5. NO DREDGING ALLOWED WITHIN 50' OF ANY PIPELINE.
6. NO DREDGING OR SPOIL DISPOSAL ALLOWED WITHIN 10' OF ANY EXISTING VEGETATION.
7. THE ALIGNMENT SHOWN IS BASED ON THE CENTERLINE OF THE STRUCTURE BEING PLACED AT AN ELEVATION OF -2.0' NAVD 88. THE ALIGNMENT MAY CHANGE BASED ON THE PRE CONSTRUCTION SURVEY.

APPLICATION BY:

National Marine Fisheries Service
South Stadium Road, Military Science Room 266
Baton Rouge, LA 70803-7535

LOUISIANA DEPARTMENT OF NATURAL RESOURCES
COASTAL RESTORATION DIVISION

617 NORTH 3RD STREET
BATON ROUGE, LOUISIANA 70802

LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION

PROJECT PLAN VIEW

STATE PROJECT NUMBER: BA-37

DATE: 9/23/03

DRAWN BY: KRISTI CANTU

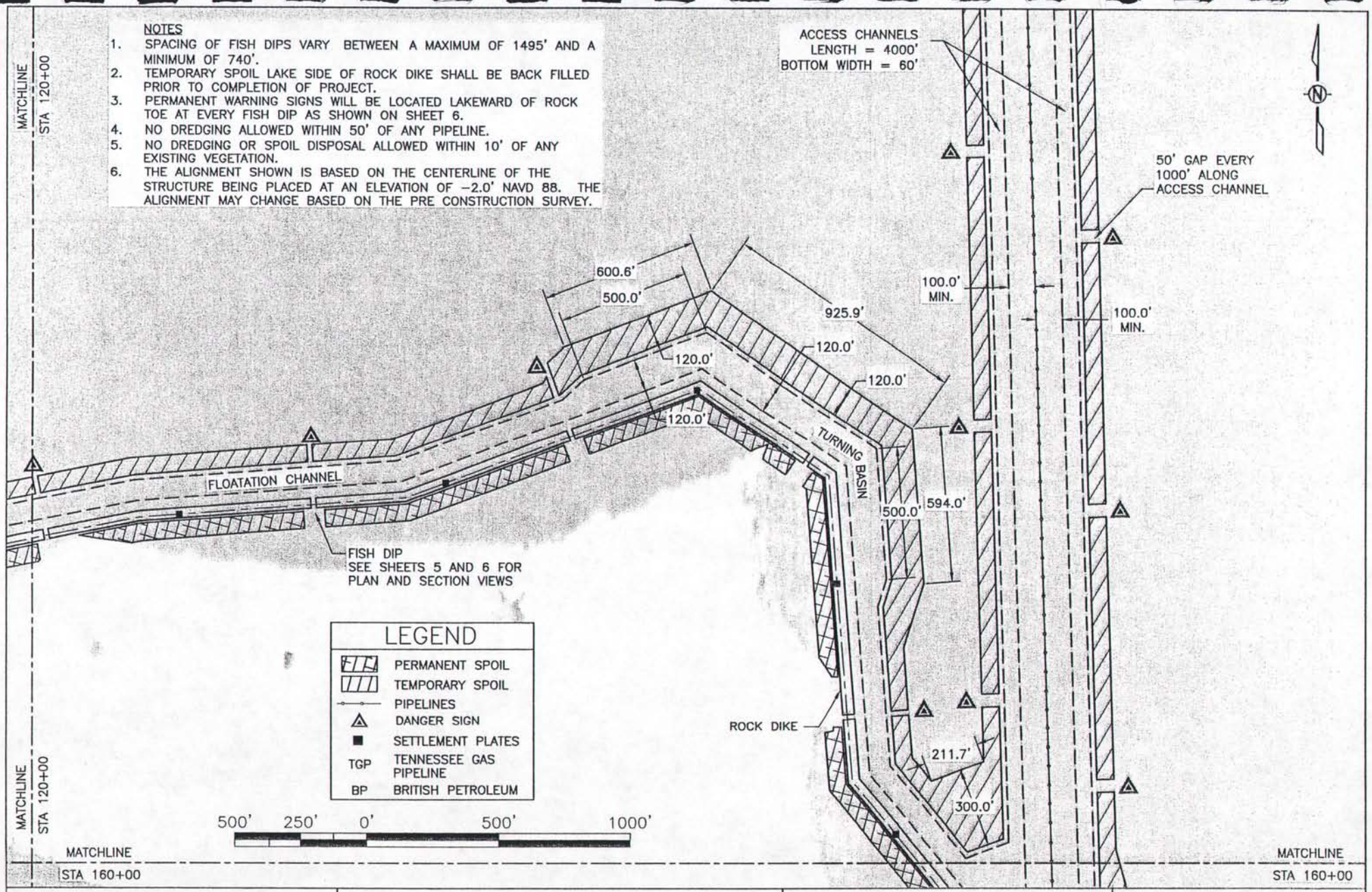
DESIGNED BY: CLARK ALLEN, P. E.

APPROVED BY: CHRIS KNOTTS, P. E.

FEDERAL PROJECT NUMBER: BA-37

SHEET 11 OF 23

Figure 14



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South Stadium Road, Military Science Room 266
Baton Rouge, LA 70803-7535

LOUISIANA DEPARTMENT OF NATURAL RESOURCES
COASTAL RESTORATION DIVISION
617 NORTH 3RD STREET
BATON ROUGE, LOUISIANA 70802

LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION

PROJECT PLAN VIEW

STATE PROJECT NUMBER: BA-37

DATE: 9/23/03

DRAWN BY: KRISTI CANTU

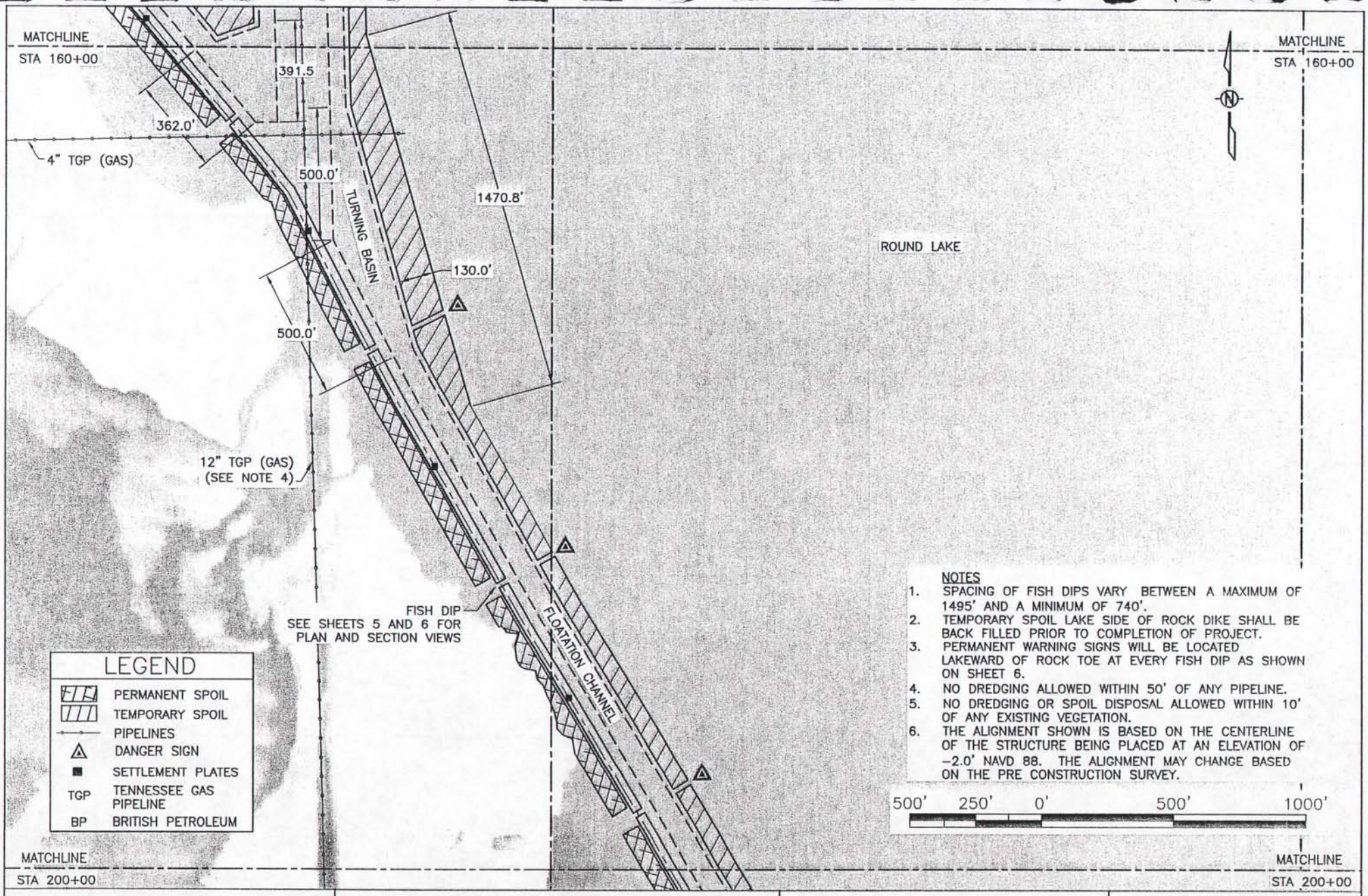
DESIGNED BY: CLARK ALLEN, P. E.

APPROVED BY: CHRIS KNOTTS, P. E.

FEDERAL PROJECT NUMBER: BA-37

SHEET 12 OF 23

Figure 15



APPLICATION BY:

National Marine Fisheries Service
South Stadium Road, Military Science Room 266
Baton Rouge, LA 70803−7535

LOUISIANA DEPARTMENT OF NATURAL RESOURCES
COASTAL RESTORATION DIVISION

617 NORTH 3RD STREET
BATON ROUGE, LOUISIANA 70802

LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION

PROJECT PLAN VIEW

STATE PROJECT NUMBER: BA−37

DATE: 9/23/03

DRAWN BY: KRISTI CANTU

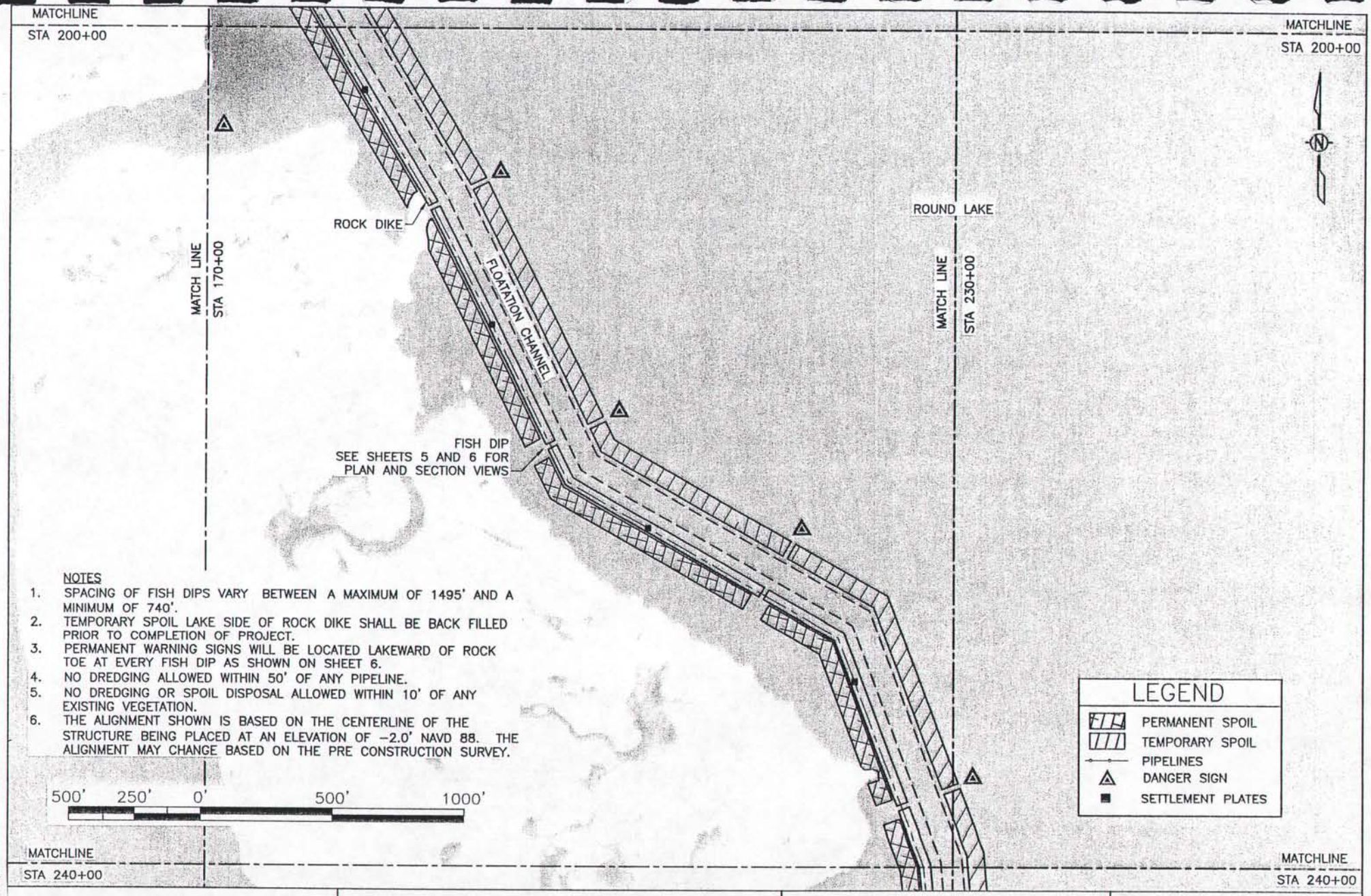
DESIGNED BY: CLARK ALLEN, P. E.

APPROVED BY: CHRIS KNOTTS, P. E.

FEDERAL PROJECT NUMBER: BA−37

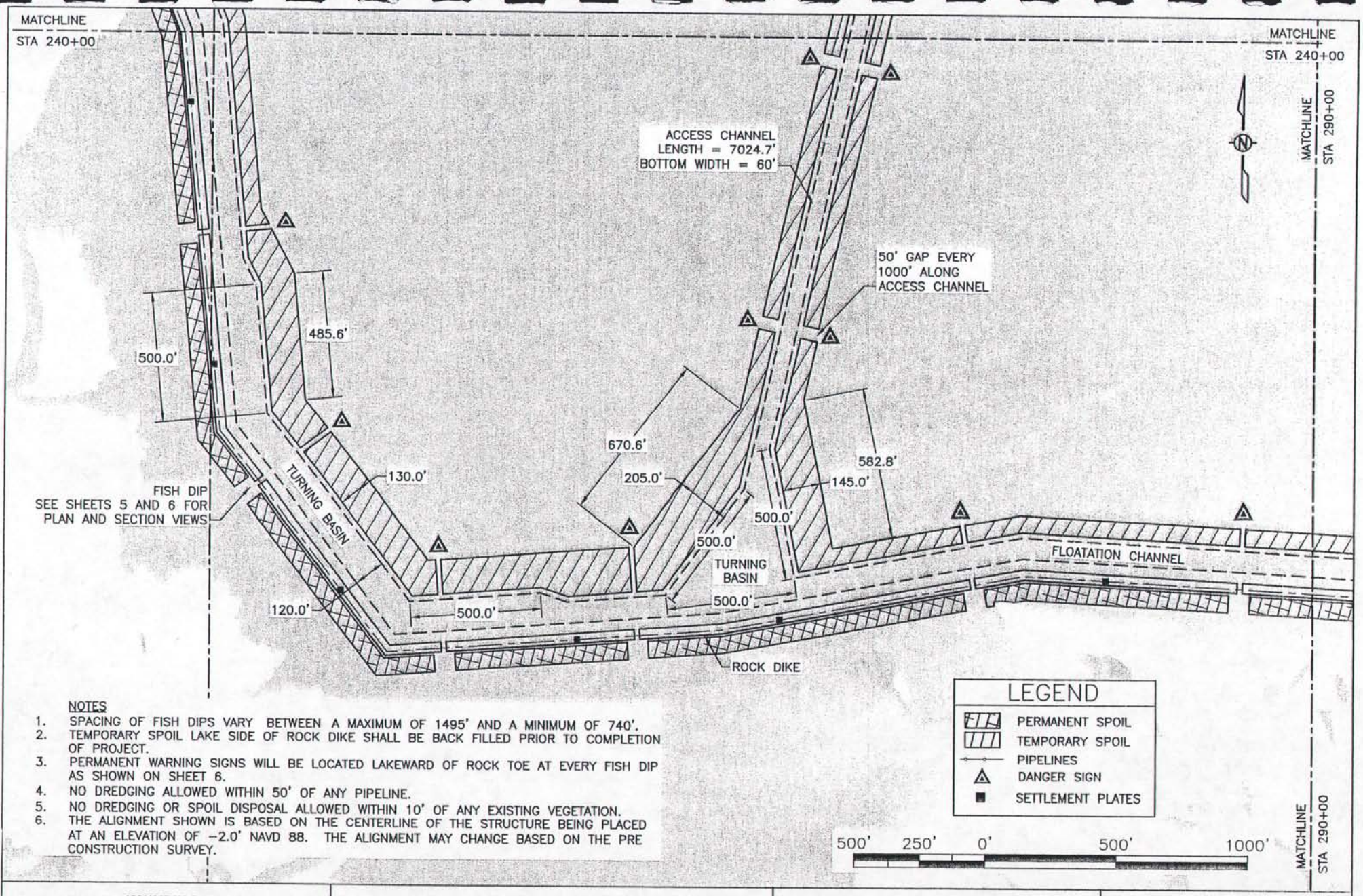
SHEET 13 OF 23

Figure 16



APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803−7535	LOUISIANA DEPARTMENT OF NATURAL RESOURCES COASTAL RESTORATION DIVISION 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802	LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	PROJECT PLAN VIEW
		STATE PROJECT NUMBER: BA−37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P. E. / APPROVED BY: CHRIS KNOTTS, P. E.	FEDERAL PROJECT NUMBER: BA−37	SHEET 14 OF 23

Figure 17

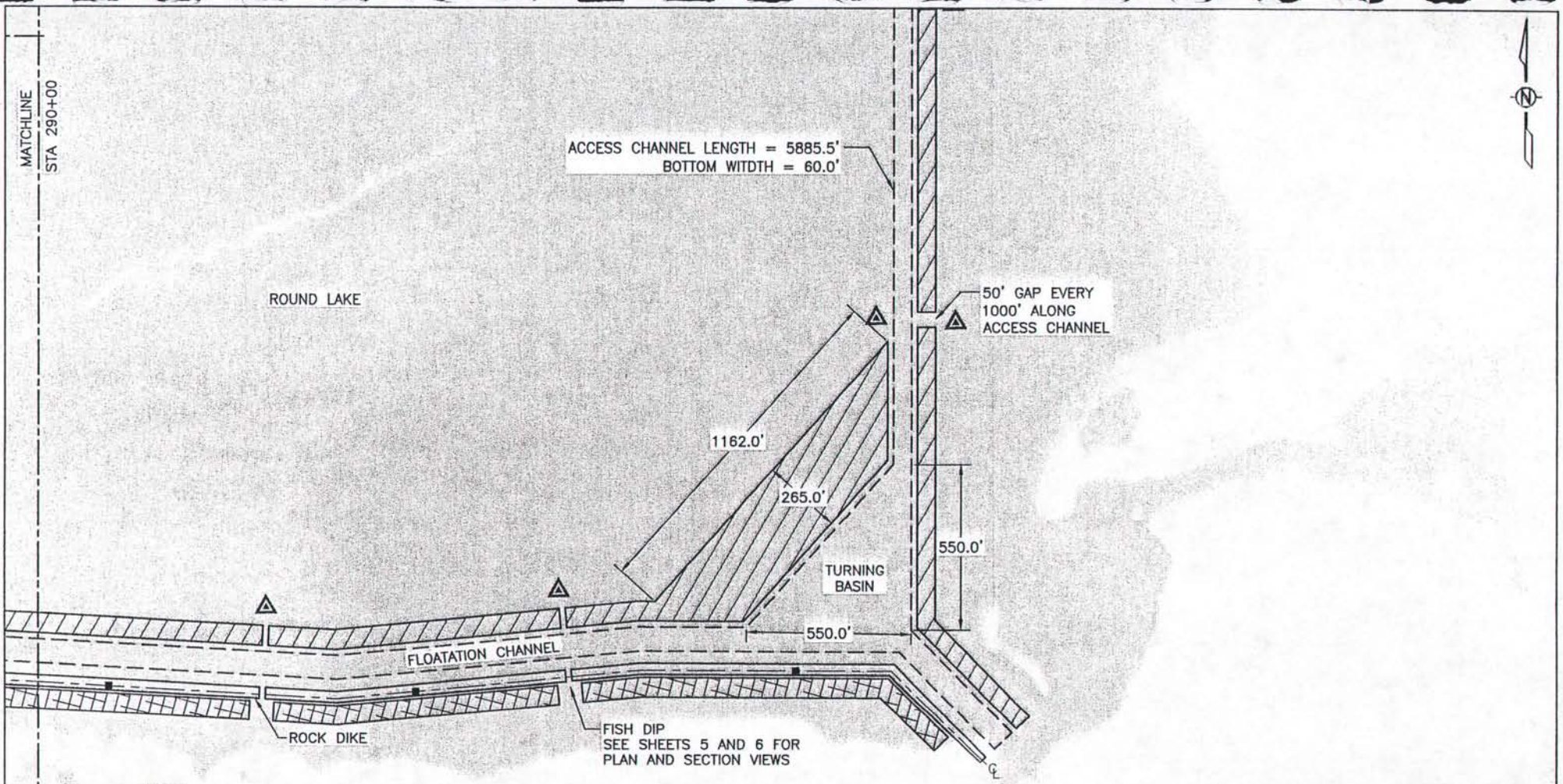


NOTES

1. SPACING OF FISH DIPS VARY BETWEEN A MAXIMUM OF 1495' AND A MINIMUM OF 740'.
2. TEMPORARY SPOIL LAKE SIDE OF ROCK DIKE SHALL BE BACK FILLED PRIOR TO COMPLETION OF PROJECT.
3. PERMANENT WARNING SIGNS WILL BE LOCATED LAKEWARD OF ROCK TOE AT EVERY FISH DIP AS SHOWN ON SHEET 6.
4. NO DREDGING ALLOWED WITHIN 50' OF ANY PIPELINE.
5. NO DREDGING OR SPOIL DISPOSAL ALLOWED WITHIN 10' OF ANY EXISTING VEGETATION.
6. THE ALIGNMENT SHOWN IS BASED ON THE CENTERLINE OF THE STRUCTURE BEING PLACED AT AN ELEVATION OF −2.0' NAVD 88. THE ALIGNMENT MAY CHANGE BASED ON THE PRE CONSTRUCTION SURVEY.

APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803-7535	LOUISIANA DEPARTMENT OF NATURAL RESOURCES COASTAL RESTORATION DIVISION 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802	LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	PROJECT PLAN VIEW
		STATE PROJECT NUMBER: BA-37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P. E. / APPROVED BY: CHRIS KNOTTS, P. E.	FEDERAL PROJECT NUMBER: BA-37	SHEET 15 OF 23

Figure 18



NOTES

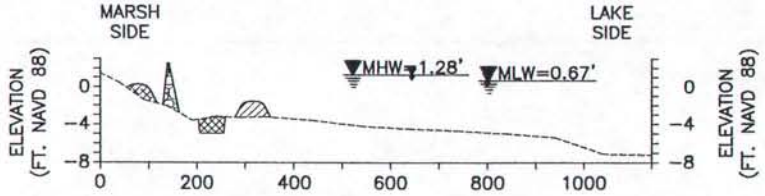
1. SPACING OF FISH DIPS VARY BETWEEN A MAXIMUM OF 1495' AND A MINIMUM OF 740'.
2. TEMPORARY SPOIL LAKE SIDE OF ROCK DIKE SHALL BE BACK FILLED PRIOR TO COMPLETION OF PROJECT.
3. PERMANENT WARNING SIGNS WILL BE LOCATED LAKE WARD OF ROCK TOE AT EVERY FISH DIP AS SHOWN ON SHEET 6.
4. NO DREDGING OR SPOIL DISPOSAL ALLOWED WITHIN 10' OF ANY EXISTING VEGETATION.
5. THE ALIGNMENT SHOWN IS BASED ON THE CENTERLINE OF THE STRUCTURE BEING PLACED AT AN ELEVATION OF −2.0' NAVD 88. THE ALIGNMENT MAY CHANGE BASED ON THE PRE CONSTRUCTION SURVEY.

LEGEND

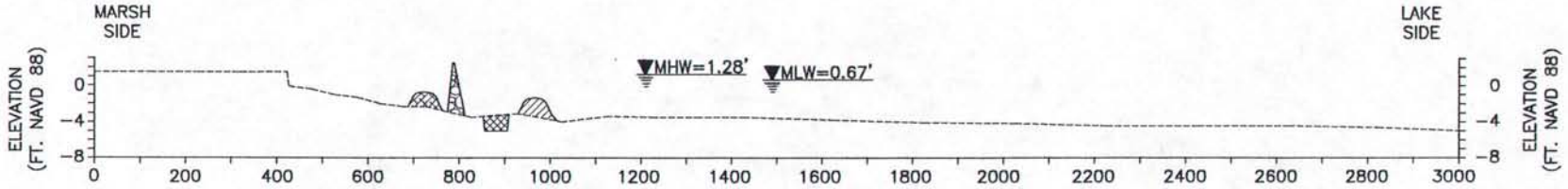
- DANGER SIGN
- PIPELINES
- TEMPORARY SPOIL
- TGP — TENNESSEE GAS PIPELINE
- BP — BRITISH PETROLEUM
- SETTLEMENT PLATES

APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803−7535	LOUISIANA DEPARTMENT OF NATURAL RESOURCES COASTAL RESTORATION DIVISION 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802	LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	PROJECT PLAN VIEW
		STATE PROJECT NUMBER: BA−37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P. E. / APPROVED BY: CHRIS KNOTTS, P. E.	FEDERAL PROJECT NUMBER: BA−37	SHEET 16 OF 23

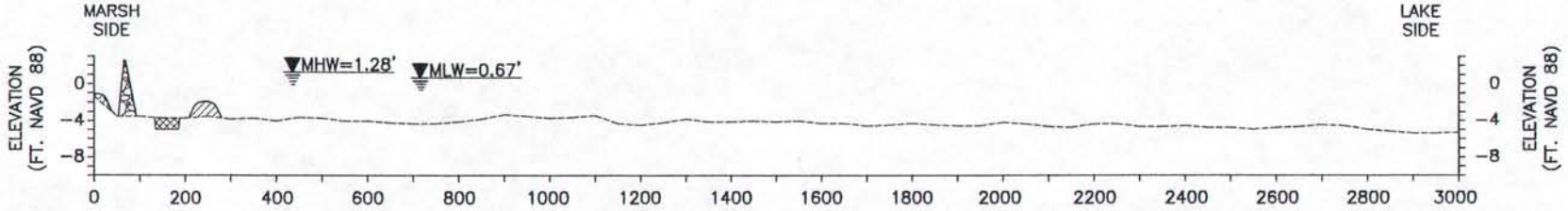
Figure 19



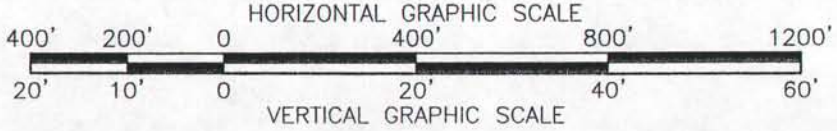
STA 100+00.01



STA 150+00

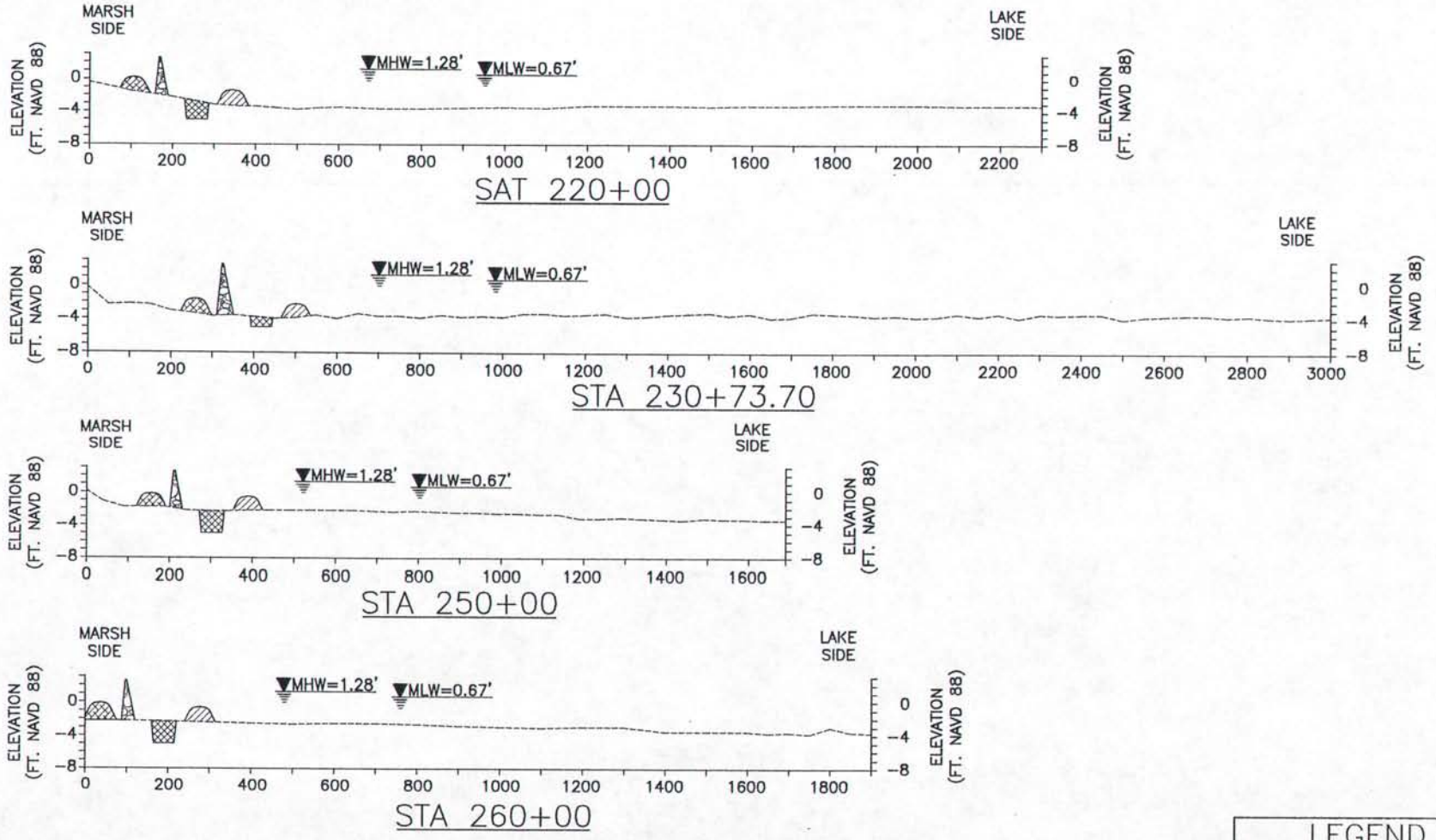


STA 190+73.70



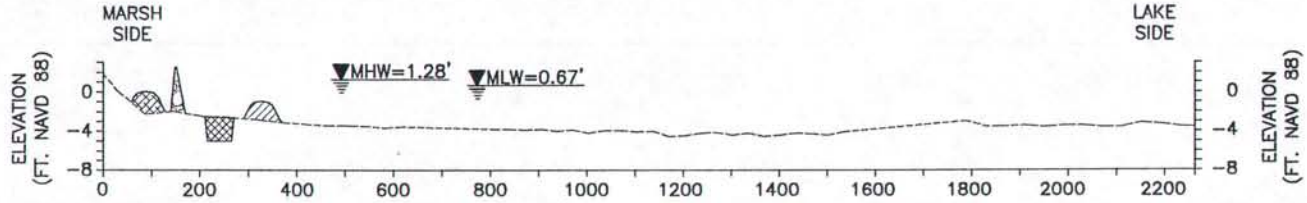
APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803-7535	**LOUISIANA DEPARTMENT OF NATURAL RESOURCES** **COASTAL RESTORATION DIVISION** 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802		LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	ROCK DIKE CROSS SECTIONS
			STATE PROJECT NUMBER: BA-37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P. E.	APPROVED BY: CHRIS KNOTTS, P. E.	FEDERAL PROJECT NUMBER: BA-37	SHEET 17 OF 23

Figure 20

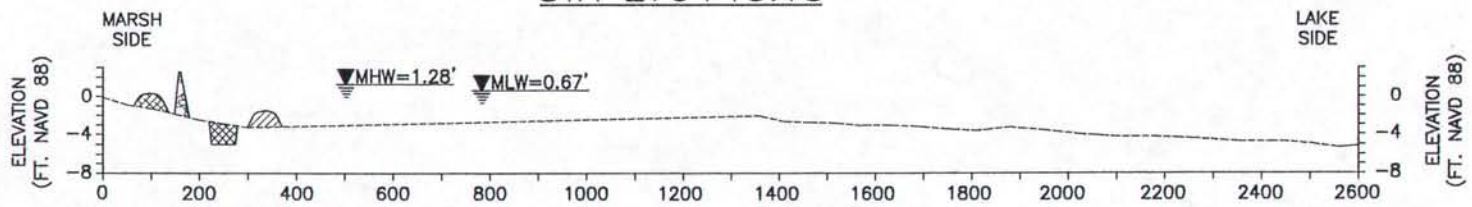


APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803-7535	**LOUISIANA DEPARTMENT OF NATURAL RESOURCES** **COASTAL RESTORATION DIVISION** 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802	LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	ROCK DIKE CROSS SECTIONS
		STATE PROJECT NUMBER: BA-37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P. E. / APPROVED BY: CHRIS KNOTTS, P. E.	FEDERAL PROJECT NUMBER: BA-37	SHEET 18 OF 23

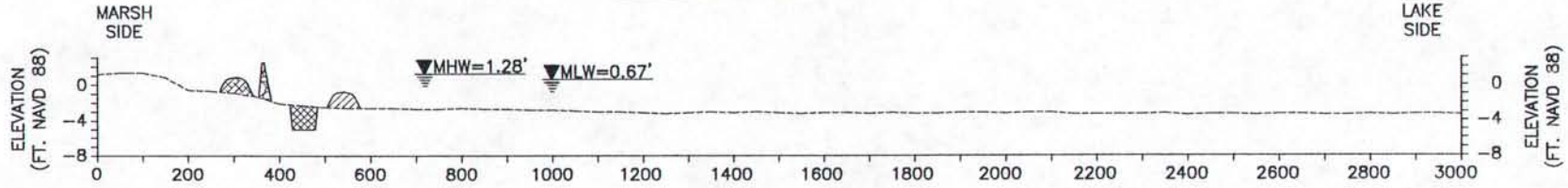
Figure 21



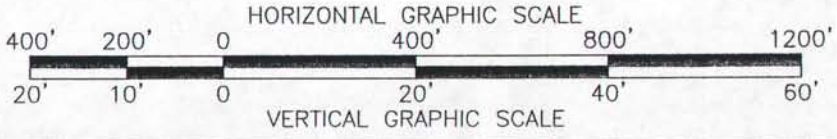
STA 279+13.18



STA 290+00



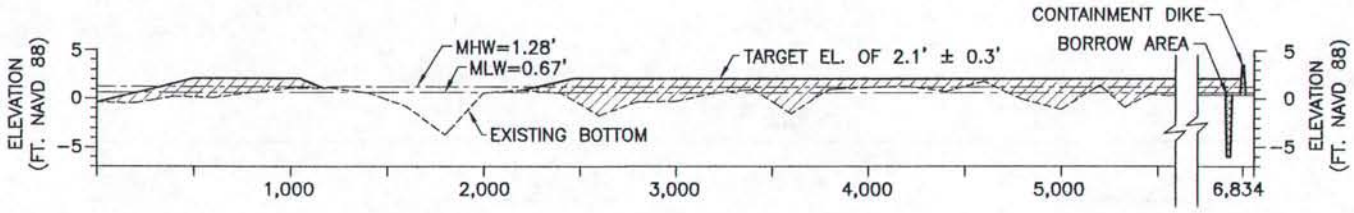
STA 317+31



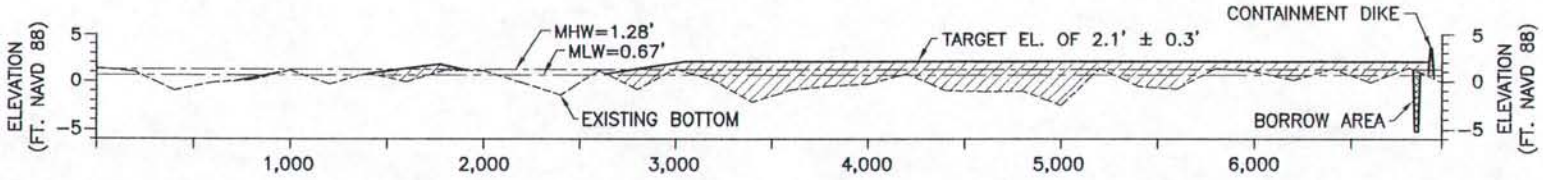
APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803-7535	**LOUISIANA DEPARTMENT OF NATURAL RESOURCES** **COASTAL RESTORATION DIVISION** 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802		LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	ROCK DIKE CROSS SECTIONS
			STATE PROJECT NUMBER: BA-37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P. E.	APPROVED BY: CHRIS KNOTTS, P. E.	FEDERAL PROJECT NUMBER: BA-37	SHEET 19 OF 23

Figure 22

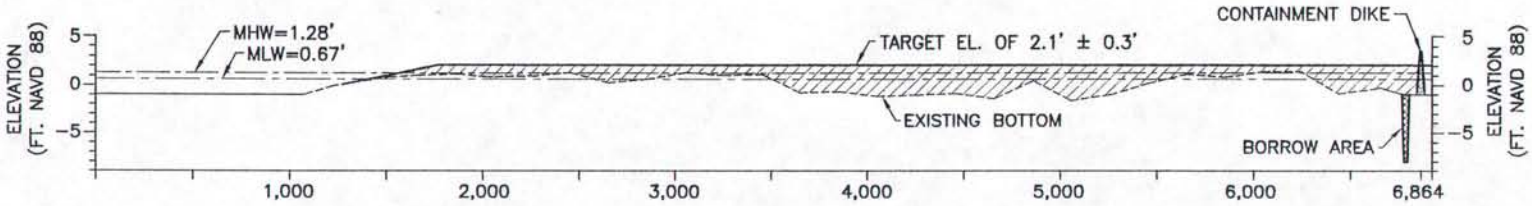
SECTION 1
LOOKING EAST



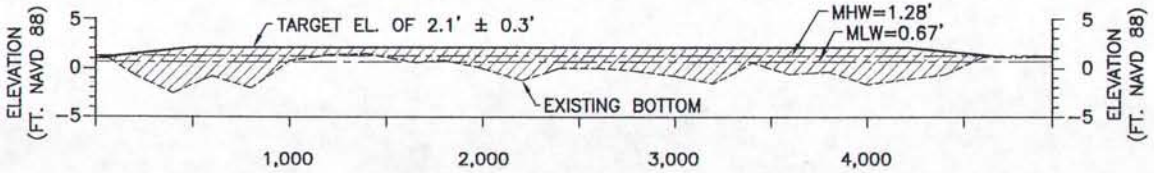
SECTION 2
LOOKING EAST

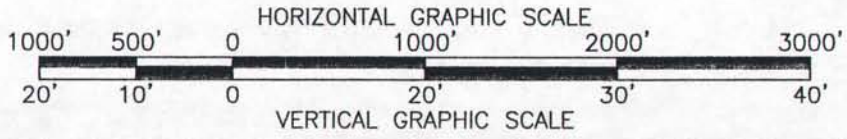


SECTION 3
LOOKING EAST



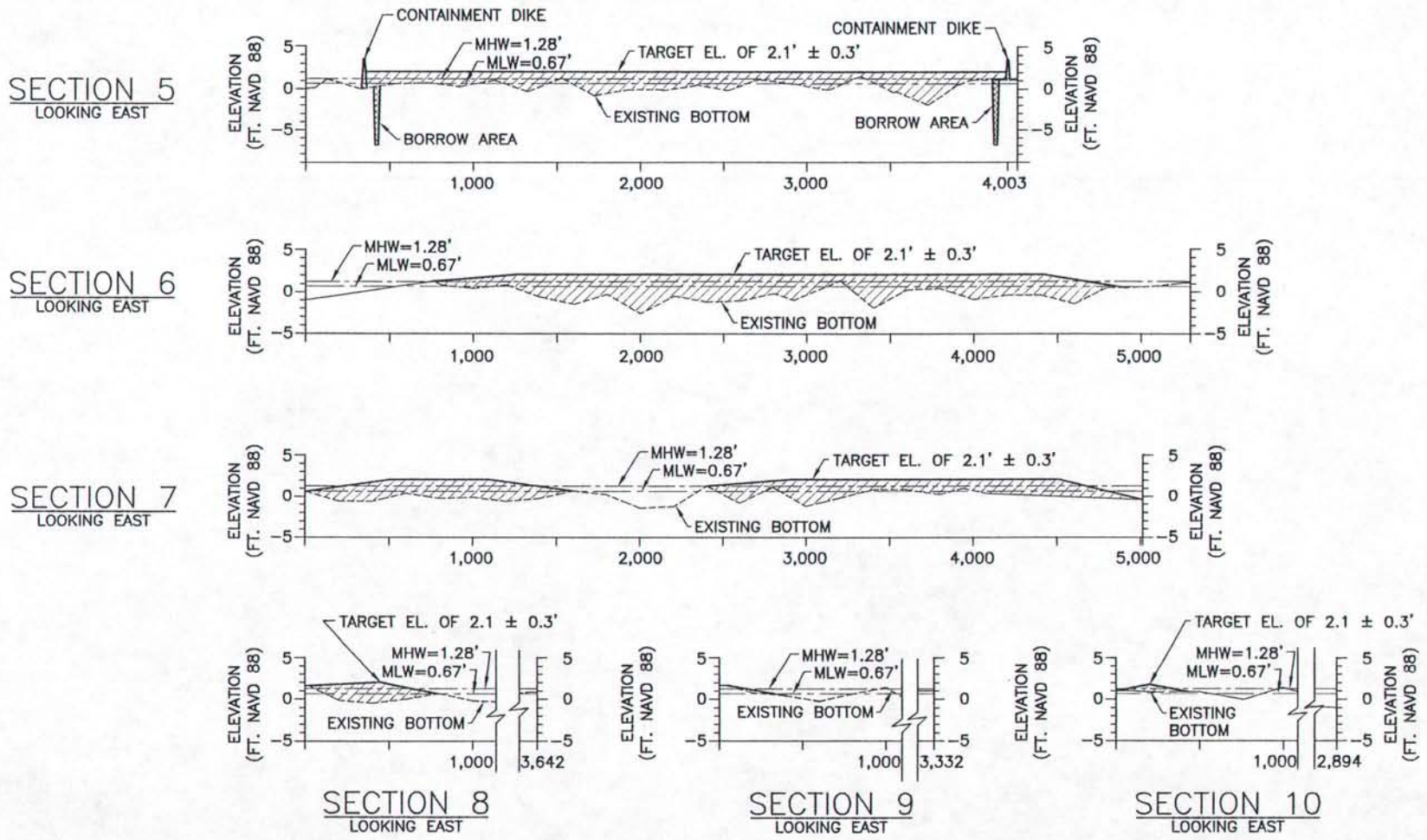
SECTION 4
LOOKING EAST





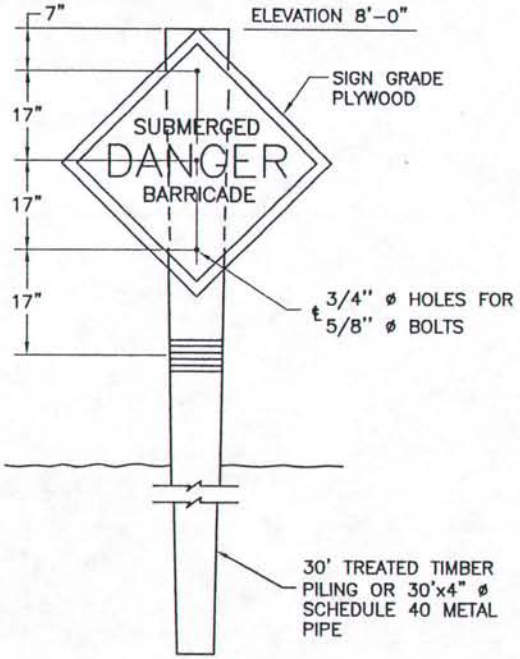
APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803-7535	**LOUISIANA DEPARTMENT OF NATURAL RESOURCES** **COASTAL RESTORATION DIVISION** 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802		LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	MARSH CREATION CROSS SECTION
			STATE PROJECT NUMBER: BA-37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P. E.	APPROVED BY: CHRIS KNOTTS, P. E.	FEDERAL PROJECT NUMBER: BA-37	SHEET 20 OF 23

Figure 23



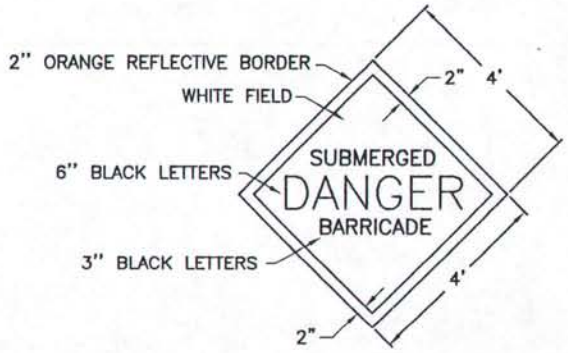
APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803-7535	**LOUISIANA DEPARTMENT OF NATURAL RESOURCES** **COASTAL RESTORATION DIVISION** 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802	LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	MARSH CREATION CROSS SECTION
		STATE PROJECT NUMBER: BA-37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P. E. / APPROVED BY: CHRIS KNOTTS, P. E.	FEDERAL PROJECT NUMBER: BA-37	SHEET 21 OF 23

Figure 24



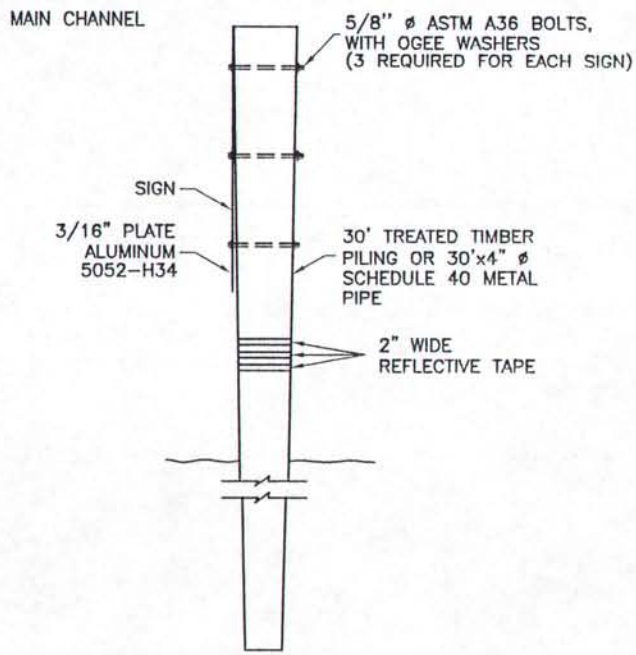
TEMPORARY WARNING SIGN ELEVATION

NOT TO SCALE



SIGN DETAIL

NOT TO SCALE



WARNING SIGN SIDE DETAIL

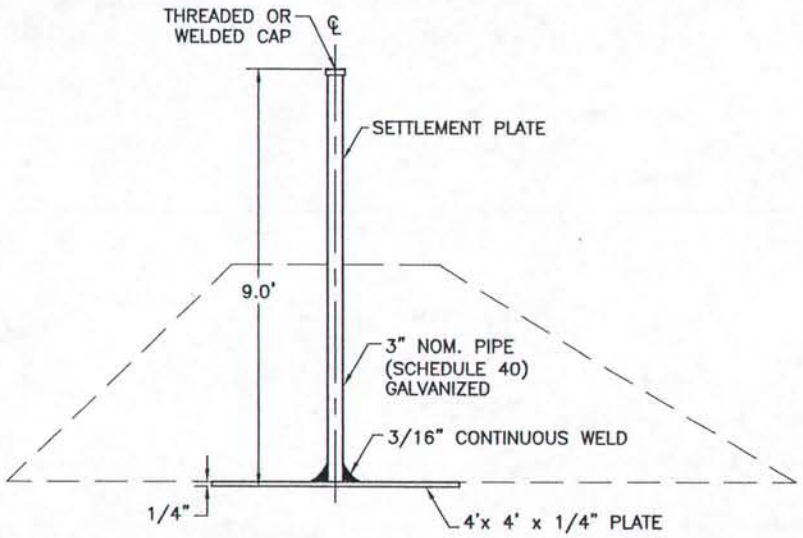
NOT TO SCALE

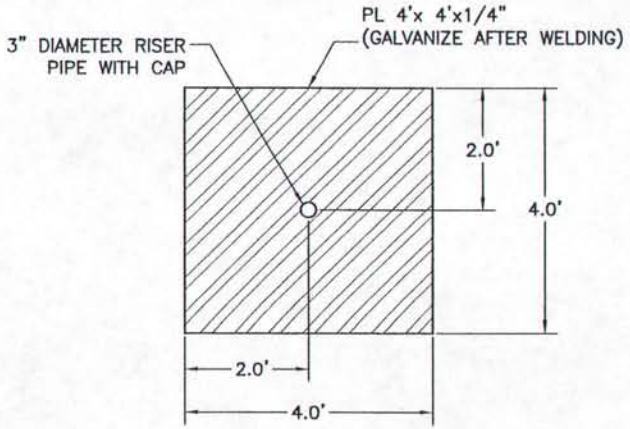
NOTES:

1. TWENTY-ONE PERMANENT AND TWENTY-ONE TEMPORARY WARNING SIGNS SHALL BE INSTALLED AT LOCATIONS STATED ON SHEET 6.
2. THE 2" BORDER ON THE WARNING SIGNS WILL BE A REFLECTIVE MATERIAL OF ORANGE COLOR. THE LETTERING FIELD WILL BE A REFLECTIVE MATERIAL OF WHITE COLOR. THE LETTERING FOR THE WARNING SIGNS WILL BE BLACK. ALL SIGNS MUST MEET U.S. COAST GUARD STANDARDS; IN ACCORDANCE WITH 33 CFR 330.4 (a)(1) WHICH CAN BE DOWNLOADED AT http://www.access.gpo.gov/nara/cfr/waisidx_02/33cfr330_002.html
3. NEOPRENE WASHERS SHALL BE PLACED BETWEEN THE SIGN AND THE PILING AT ALL POINTS OF CONTACT.
4. HARDWARE FOR TIMBER CONNECTIONS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH SECTION 811.5 OF LOUISIANA STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES, AS PUBLISHED BY THE LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT, LATEST EDITION.
5. TIMBER PILES SHALL CONFORM TO SECTIONS 804 AND 1014 OF THE LOUISIANA STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES, AS PUBLISHED BY THE LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT, LATEST EDITION. PILES SHALL BE TREATED WITH A CREOSOTE SOLUTION CONFORMING TO AWPA P2 TO A MINIMUM RETENTION OF 16 PCF AND CAPPED ACCORDING TO LA DOTD SPECIFICATION 812.06.
6. THE CONTRACTOR HAS THE OPTION OF USING A 30'x4" ø SCHEDULE 40 METAL PIPE OR OTHER APPROVED MATERIAL FOR TEMPORARY SIGNS.
7. TIMBER PILINGS SHALL BE 30-FEET IN LENGTH WITH A NOMINAL 12-INCH DIAMETER BUTT AND 7-INCH MINIMUM DIAMETER AT THE TIP.
8. THE TEMPORARY SIGNS SHALL BE INSTALLED AT NO DIRECT PAY.
9. TEMPORARY WARNING SIGNS SHALL HAVE THE SAME COLORING AND REFLECTIVE TAPE AS PERMANENT SIGNS BUT CONSTRUCTED WITH 3/4" SIGN GRADE PLYWOOD.
10. THE SUPPORTS FOR THE TEMPORARY SIGNS SHALL BE REMOVED TO 5' BELOW MUD LINE OR REMOVED COMPLETELY AFTER PERMANENT SIGNS ARE ACCEPTED.

APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803-7535	**LOUISIANA DEPARTMENT OF NATURAL RESOURCES** **COASTAL RESTORATION DIVISION** 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802		LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	SIGN DETAILS
			STATE PROJECT NUMBER: BA-37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P.E.	APPROVED BY: CHRIS KNOTTS, P.E.	FEDERAL PROJECT NUMBER: BA-37	SHEET 22 OF 23

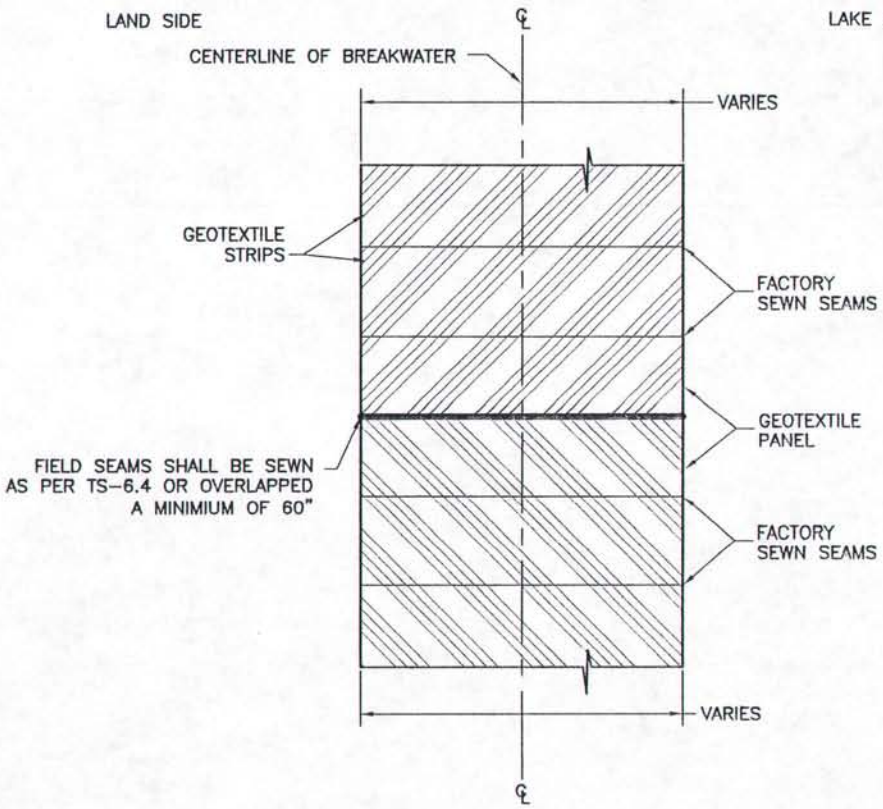
Figure 25





SETTLEMENT PLATE

NOT TO SCALE



WOVEN GEOTEXTILE LAYOUT

NOT TO SCALE

SETTLEMENT PLATE NOTES:

1. SETTLEMENT PLATES SHALL BE INSTALLED ALONG THE CENTERLINE OF THE BREAKWATER AS SHOWN ON SHEETS 11–16.
2. THE SETTLEMENT PLATES SHALL BE SURVEYED DAILY BY THE CONTRACTOR AND WITNESSED BY THE DNR INSPECTOR UNTIL THE ROCK IS ACCEPTED.
3. SETTLEMENT PLATES SHALL BE BUILT USING ASTM A36 STEEL AND HOT-DIPPED GALVANIZED AFTER FABRICATION.

APPLICATION BY: National Marine Fisheries Service South Stadium Road, Military Science Room 266 Baton Rouge, LA 70803-7535	**LOUISIANA DEPARTMENT OF NATURAL RESOURCES** **COASTAL RESTORATION DIVISION** 617 NORTH 3RD STREET BATON ROUGE, LOUISIANA 70802		LITTLE LAKE SHORELINE PROTECTION AND MARSH CREATION	TYPICAL DETAILS
			STATE PROJECT NUMBER: BA-37	DATE: 9/23/03
DRAWN BY: KRISTI CANTU	DESIGNED BY: CLARK ALLEN, P.E.	APPROVED BY: CHRIS KNOTTS, P.E.	FEDERAL PROJECT NUMBER: BA-37	SHEET 23 OF 23

Figure 26

APPENDIX
A

AGENCY COORDINATION LETTERS

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
SEFC/Estuarine Habitats & Coastal Fisheries Center
646 Cajundome Boulevard
Lafayette, Lousiana 70506

June 26, 2003

Ms. Laurel Wyckoff
State of Louisiana
Office of the Leutenant Governor
Office of cultural Development
Division of Archaeology
P.O. Box 44247
Baton Rouge LA 70804-4247

Date: 7-14-03
No known archaeological sites or historic properties will be affected by this undertaking. This effect determination could change should new information come to our attention.
Laurel Wyckoff: Laurel Wyckoff
State Historic [illegible] Officer

Dear Ms. Wyckoff,

Please find enclosed an environmental assessment concerning the National Marine Fisheries Service sponsored Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake Project (BA-37), funded under the Coastal Wetlands Planning, Protection, and Restoration Act.

We would greatly appreciate your review of this document. The Little Lake project will enhance the capacity of this area by reducing shoreline erosion, reestablishing marsh and nourishing existing marsh through hydrologic dredging, and contribute to the continued existence of this unique system. Please return your comments to my office no later than August 8, 2003.

Sincerely,

John D. Foret, Ph.D.

Enclosure

JUN 3 0 2003

State of Louisiana

James H. Jenkins, Jr.
Secretary

Department of Wildlife & Fisheries
Post Office Box 98000
Baton Rouge, LA 70898-9000
(225)765-2800

M.J. "Mike" Foster, Jr.
Governor

July 1, 2003

Dr. John D. Foret
National Marine Fisheries Service
646 Cajundome Boulevard
Lafayette, LA 70506

Re: Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake Project (BA-37), Lafourche Parish, Louisiana

Dear Dr. Foret:

In reviewing the environmental assessment document dated June 2003 supplied for the above reference project, we find that our comments given during a meeting on May 27, 2003 concerning this project have not been addressed or included within this document.

Your attention to this matter is appreciated.

Sincerely,

Fred O. Dunham
Biologist Supervisor
Habitat Section

c: Heather Finley

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506
August 8, 2003

John D. Foret, Ph.D.
National Marine Fisheries Service
SEFC/Estuarine Habitats and Coastal Fisheries Center
646 Cajundome Boulevard
Lafayette, Louisiana 70506

Dear Dr. Foret:

Please reference the June 2003 Environmental Assessment (EA) for the Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake Project. That EA evaluates the potential impacts associated with shoreline protection, marsh creation, and marsh nourishment in brackish wetlands south of Little Lake in Lafourche Parish, Louisiana. The U.S. Fish and Wildlife Service submits the following comments in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.), and the National Environmental Policy Act (83 Stat. 852, as amended; 42 U.S.C. 4321-4347).

General Comments

The EA adequately addresses the potential impacts to fish and wildlife resources associated with project implementation. The project area consists of brackish and intermediate marshes and associated open-water habitat, and provides important habitat for several fish and wildlife species under Federal trusteeship, including waterfowl, shorebirds, wading birds, and estuarine-dependent fishes and shellfishes. The project will restore emergent wetland habitat and protect emergent wetlands from future loss, thereby benefitting numerous fish and wildlife species.

Specific Comments

Page 2, Paragraph 5, Sentence 2 - This sentence should be revised to indicate that Little Lake is located between Bayou Perot and Barataria Bay.

Page 3, Paragraph 3, Last Sentence - This sentence should be omitted from this paragraph, which describes wetland loss only in the Barataria Basin. The loss rate of 24 square miles per year indicated in this sentence is for all of coastal Louisiana.

Page 4, Paragraph 2, Last Sentence - We recommend that this sentence be revised as follows: The WVA predicted that 57 acres would be lost in Area B and 139 acres would be lost in Area C under FWOP conditions.

Page 17, Paragraph 2, Sentence 2 - Reference to squirrels in this sentence should be omitted. It is

unlikely that squirrels would utilize the wetlands in the project vicinity, as those wetlands lack forested habitat.

Page 22, Paragraph 3, Sentence 1 - It should not be stated that no submerged aquatic vegetation will occur without the project. Even under future without-project conditions, we anticipate that submerged aquatic vegetation would still exist in limited amounts. The Wetland Value Assessment also predicted that submerged aquatic vegetation would continue to exist without the project.

Page 24, Paragraph 2, Sentence 1 - We concur that the project is not likely to adversely impact any threatened or endangered species or their critical habitat.

The Service appreciates the opportunity to comment on the draft EA. If you have any questions regarding our comments, please contact Kevin Roy at (337) 291-3120.

Sincerely,

David W. Frugé
Supervisor
Louisiana Field Office

cc: EPA, Baton Rouge, LA
NMFS, Baton Rouge, LA
U.S. Army Corps of Engineers, New Orleans, LA
NRCS, Alexandria, LA
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Natural Resources (CRD), Baton Rouge, LA

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
3737 Government Street
Alexandria, LA 71302

Water Resources Planning Staff
phone (318) 473-7690
fax (318) 473-7747

July 29, 2003

Dr. John D. Foret
National Marine Fisheries Service
SEFC/Estuarine Habitats & Coastal Fisheries Center
646 Cajundome Boulevard
Lafayette, LA 70506

Dear Dr. ~~Foret~~ John,

Attached are our comments on the Draft Environmental Assessment for Little Lake SP/DD Project (BA-37).

Thank you for the opportunity to review this document.

Sincerely,

Martin D. Floyd
Biologist

cc Britt Paul, ASC/WR/RD, NRCS, Alexandria, LA

Comments on EA for Little Lake SP/DD project (BA-37)

Pg2, 1.1 Project Location, para1 – "approximately 1,374 acres … and Area C – 206 acres (83 hectares)." ~ *need map showing where these areas are located (these areas are referenced in other parts of the document also)*

Pg4, 1.3.1, para1, sent6 – "This figure … unit (~~Coast 2050,~~ **LCWCRTF, 1993** Appendix D), however …"

Pg5, 1.3.3, para2, sent2 – "Completion of the Landbridge … Agriculture, 2000)."

Pg7, 2.2.2, sent1 – "Continued wetland loss … and ~~coastwise~~ **coastwide**."

Pg9, 3.3, para1, sent2 – "Since this alternative ~~also~~ would …"

Pg11, 3.4.3, para1, sent1 – "Approximately 50,000 … cordgrass ~~*Spartina alterniflora*~~ (***Spartina alterniflora***) will be …"

Pg12, 4.1.1, para1, sent2 – "As a new delta lobe … (every 750 to 1,000) years … to another location." When was last switch???

Pg12, 4.1.1, para2, sent1 – "The project area, located … the Lafourche Complex) *space* (Kolb and Van Lopik, 1958)."

Pg12, 4.1.1, para2, sent3 – "Analysis shows the soils … herbaceous material) and …"

Pg13, 4.1.2, para3, sent3 – "The paths of Hurricanes Isodore … National Weather Service, 2002)." ~ *citation has 2003*

Pg16, 4.2.3, para1, sent4 – "Sport fishes sought after… *nebulosus*, spot *Leiostomus xanthurus*, …" ~ *since when is spot considered a sport fish in Louisiana? This should be listed as commercial only*

Pg16, 4.2.4, para1 ~ *why no scientific names after birds; be consistent*

Pg17, 4.2.4, para1, sent1 – "survey, (Michot et al., 2003) … colony of 475 ~~Forrester's~~ **Forester's** tern …"

Pg17, 4.2.4, para3 – *Add paragraph* "**EO #13186**"

Pg19, 4.3.2, para1, sent3 – "About 90 percent … around Little Lake." ~ *cite Coreil, 19xx*

Pg24, 5.3.1, sent3 – "Procedures required under Section 106 ~~if~~ **of** the National …"

Pg33 - "~~APPENDEX~~ **APPENDIX** A"

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, Florida 33702

July 22, 2003 F/SER44/RS:jk
225/389-0508

Dr. John D. Foret
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Estuarine Habitats and Coastal Fisheries Center
646 Cajundome Boulevard
Lafayette, Louisiana 70506

Dear Dr. Foret:

The National Marine Fisheries Service (NOAA Fisheries) has received the draft Environmental Assessment (EA) titled "**LITTLE LAKE SHORELINE PROTECTION/DEDICATED DREDGING NEAR ROUND LAKE; CWPPRA PROJECT (BA-37); Lafourche, Louisiana**" transmitted by your June 26, 2003, letter. The draft EA evaluates the potential impacts associated with the restoration of about 551 acres and nourishment of about 406 acres of intertidal wetlands, construction of approximately 22,000 feet of shoreline protection, and dredging about 1,300 acres of Little Lake waterbottoms. The purpose of the project is to protect and restore over 713 acres of emergent wetlands over the twenty year project life. The project is funded under the auspices of the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), with NOAA Fisheries serving as the Federal sponsor.

NOAA Fisheries has reviewed the draft EA and finds that the document adequately addresses potential impacts to resources of concern. However, we have the following comments regarding information provided within the document:

GENERAL COMMENTS

The document presents the evaluation of the environmental consequences of the no action and preferred alternatives within a single section for each major resource. We find this format to be confusing as the text switches back and forth between discussions of the consequences of the no action and preferred alternatives. We recommend the EA be revised to include subsections under each resource heading which separately describe the environmental consequences of each alternative.

SPECIFIC COMMENTS

TITLE PAGE
The term "Lafourche, Louisiana" should be revised to indicate the project is located in "Lafourche Parish, Louisiana".

1.01 INTRODUCTION
1.3. Technical Background
1.3.1. Wetland Loss

Page 4, paragraph 1. This section of the document includes a sentence stating that "no land loss rate was applied to .... Areas B and C." Although the document later clarifies that shoreline erosion rates were applied to these two areas, we recommend this statement be revised to correctly describe the land loss and shoreline erosion rates applied to each project area.

Page 4, paragraph 2. Wording in this paragraph indicates that under the Future Without Project (FWOP) scenario, the Wetland Value Assessment (WVA) projected that by TY20, Area B would lose 3 acres and Area C would lose 7 acres. The WVA projected *annual* losses of 3 acres and 7 acres for Areas B and C respectively, and total losses of 56 acres in Area B and 132 acres in Area C by TY20. We recommend the document be revised to include the correct information regarding projected habitat losses.

1.3.3. Current Conditions

Page 5, paragraph 3. The draft EA that several barrier island projects "will" receive CWPPRA funding. Under the current cash-flow approach to project authorization and funding, it is very uncertain whether construction of the barrier island projects will be funded. We recommend this statement be revised to reflect the cash-flow approach to project authorization and funding. Additionally, wording in the paragraph incompletely describes the stretches and locations of the proposed barrier island restoration projects. We recommend this be changed to: East/West Grand Terre Islands, Pelican Island, Pass La Mer to Chaland Pass, and Pass Chaland to Grand Bayou Pass.

3.0 ALTERNATIVES INCLUDING PROPOSED ACTION
3.4 Shoreline Protection and Marsh Creation (Preferred Alternative)
3.4.1. Shoreline Protection

Page 9, paragraph 4. This section of the document describes the shoreline protection components of the preferred alternative, and references several figures. This section also describes dredging of an access channel for construction. The referenced figures do not depict the limits or ends of the access channels. We recommend the document be revised to clearly depict the limits of all work associated with construction.

Page 9, paragraph 5. This paragraph describes a rock dike construction alignment along the -2 foot contour, but does not explain why this alignment is preferred. We recommend the rationale for the alignment of the shoreline protection be briefly explained in this section of the document.

3.4.2. Fishery Access

Page 10, paragraph 3. We recommend the second sentence be revised to state that "Each fish gap opening will be ...."

4.0 AFFECTED ENVIRONMENT
4.2 Biological Environment
4.2.2. Essential Fish Habitat

Page 15, paragraph 3. This section of the document correctly identifies the categories of EFH in the project area and the Federally managed species and life stages likely to use that EFH. It also assesses some of the benefits to EFH that would result from the preferred alternative. We recommend the assessment of potential impacts and benefits be addressed entirely in Section 5., Environmental Consequences.

Page 16, paragraph 1. This paragraph states that coordination letters are included in Appendix A, although that appendix does not include any correspondence. We recommend the revised EA include such letters referred to here and in the Threatened and Endangered Species section.

4.2.3 Fishery Resources

Page 16, paragraph 2. Wording in this paragraph indicates that bay anchovy, Atlantic croaker, gafftopsail catfish and blue hardhead catfish are commercially fished species in the Barataria Basin. We know of no commercial fishery for any of these species in this area and recommend they be deleted from mention in the sentence describing the other commercially fished species. If, for some reason they are left in the text, correct common names for Arius felis are "hardhead catfish" or "sea catfish".

5.0 ENVIRONMENTAL CONSEQUENCES
5.2 Biological Environment
5.2.1 Vegetative Communities

Page 22, paragraph 1. This section of the document summarizes in very general terms the potential project benefits. We recommend it be revised to fully describe the anticipated effects of the no action and preferred alternatives. Information regarding anticipated changes in wetland loss rates for the future with and future without project scenarios, total acres anticipated to be lost under the no action alternative (185, 56, and 132 acres respectively for Areas A, B, and C), and net acres anticipated to be benefitted through the full project life should be included in this section. Additionally, given rather limited experiences with marsh nourishment, we recommend the document be revised to include a brief discussion of the anticipated effects of the proposed thin-layer, marsh nourishment features of the project. Research and work undertaken by Dr. Irv Mendelssohn at Louisiana State University could be cited as a basis for such a discussion.

Page 22, paragraph 2. The draft EA briefly describes the anticipated effects of the no action and preferred alternatives on submerged aquatic vegetation, and indicates that no submerged aquatic vegetation (SAV) would occur without the project. However, the Environmental Work Group estimated the open water areas to have 10% coverage of SAV at present and did not expect that number to change without project implementation. We recommend the document be revised to accurately reflect previous analyses, unless supplemental information has become available.

NOAA Fisheries finds that the document adequately addresses potential impacts to resources of concern. We concur with your determination that while certain categories of EFH would be adversely impacted by project implementation, more productive categories of EFH, such as marsh, marsh edge, and SAV, would be protected and restored.

We appreciate the opportunity to review and comment on the draft EA.

Sincerely,

Richard Hartman

for Federick C. Sutter III
Deputy Regional Administrator

c:
FWS, Lafayette
EPA, Dallas
NRCS, Alexandria
COE, Planning
LA DNR, Consistency
F/SER4
Files

UNITED STATES DEPARTMENT OF COMMERCE
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AUG 25 2003

F/SER3:JJ

MEMORANDUM FOR: John D. Foret, Ph.D.
SEFSC/Estuarine Habitats & Coastal Fisheries Center

FROM: Roy E. Crabtree, Ph.D.
Regional Administrator

SUBJECT: Section 7 Consultation Regarding the Little Lake Shoreline Protection/Dedicated Dredging Project Near Round Lake in Louisiana (I/SER/2003/00894)

This is in response to your June 26, 2003 letter and accompanying information requesting section 7 consultation from NOAA Fisheries' Protected Resources Division (PRD), pursuant to the Endangered Species Act of 1973 (ESA). The project involves protecting, nourishing, and creating wetlands in the southwestern area of Little Lake in the Barataria Basin, Lafourche Parish, Louisiana. The project involves dredging and creating a rock dike. The applicant indicated that the project will not likely adversely affect listed species. As discussed below, this consultation concurs with the conclusion that ESA-listed species and critical habitat under NOAA Fisheries' jurisdiction are not likely to be adversely affected by the proposed action. Please refer to consultation number I/SER/2003/00894 in future correspondence on this project.

The project is located approximately one-third of the distance between Lake Salvador and Barataria Pass in the southern half of Barataria Basin. Little Lake is a large estuarine circulation system with brackish water.

Your office provided us with a copy of the report "Environmental Assessment of Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake; CWPPRA Project BA-37," prepared by GOTECH, Inc. The Preferred Alternative involves dredging (bucket or hydraulic) 90 acres of water bottom; constructing a 22,200 foot (43 acre) rock dike in order to prevent erosion along 4 miles of shoreline; creating 551 acres of intertidal wetlands; nourishing and maintaining 406 acres of intermediate marsh by placing 6-12 inches of dredged material on top; dredging 1,300 acres of Little Lake to use as fill using a bucket dredge or hydraulic pipeline dredge; planting smooth cordgrass; constructing retention dikes along selective portions of the perimeter; and reducing land loss rates by 50 percent over the 20-year life of the project. The project will also involve fish gaps in the rock dike to allow for marine organism passage.

ESA-listed species under the purview of NOAA Fisheries which are often found near the project location in the Gulf of Mexico include the green (*Chelonia mydas*), loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*) sea turtles. The EA describes the project area as not providing suitable forage or habitat for sea turtles. Additionally, dredging activity conducted by bucket or hydraulic dredge has not been shown to adversely affect sea turtles, which are highly mobile and will likely be frightened away from the project area by dredging activity and noise (August 29, 1997, Biological Opinion to the U.S. Army Corps of Engineers, South Atlantic Division). Therefore, sea turtles are not likely to be adversely affected by this project.

The project area is not within green turtle, hawksbill turtle, or leatherback turtle critical habitat and therefore the project will not destroy or adversely modify designated critical habitat for these species.

The threatened Gulf sturgeon is managed jointly by NOAA Fisheries and the U.S. Fish and Wildlife Service. Historically, Gulf sturgeon occurred from the Mississippi River to Tampa Bay; sporadic occurrences have been recorded as far west as the Rio Grande River, and as far east and south as Florida Bay. There are no occurrence records of Gulf sturgeon in Little Lake. If Gulf sturgeon were present during the project, because of their mobility, they should be able to avoid the slow moving dredge equipment when they detect the approaching draghead. Therefore, Gulf sturgeon are not likely to be adversely affected by this project.

Gulf sturgeon critical habitat was designated March 19, 2003 (68 FR 13370). Because the project area is not within designated Gulf sturgeon critical habitat, the project will not destroy or adversely modify designated critical habitat for this species.

The action agency is also reminded that, in addition to its protected species/critical habitat consultation requirements with PRD pursuant to section 7 of the ESA, prior to proceeding with the proposed action the action agency must also consult with NOAA Fisheries' Habitat Conservation Division (HCD) pursuant to the Magnuson-Stevens Fishery Conservation and Management Act's requirements for essential fish habitat (EFH) consultation (16 U.S.C. 1855 (b)(2) and 50 CFR 600.905-.930, subpart K). The action agency should also understand the ESA and EFH processes; that ESA and EFH consultations are separate, distinct, and guided by different statutes, goals, and time lines for responding to the action agency; and that the action agency will receive separate consultation correspondence on NOAA Fisheries letterhead from HCD regarding their concerns and/or finalizing EFH consultation. Consultation is not complete until EFH and ESA concerns have been addressed. If you have any questions about EFH consultation for this project, please contact Mr. Richard Hartman, HCD, at (225) 389-0508.

Based on your description of the proposed activity and your commitment to protect federally-listed species, we concur with your determination that this project will not likely adversely affect federally-listed species or designated critical habitat under NOAA Fisheries' purview. We believe that the requirements of section 7 of the ESA have been satisfied and no further consultation is required. However, obligations under section 7 of the Act must be reconsidered if: (1) there is a take; (2) new information reveals impacts of the identified action that may affect listed species or critical habitat in a manner not previously considered; (3) this action is subsequently modified in a

manner which was not considered in this assessment; or (4) a new species is listed or critical habitat designated that may be affected by the identified action.

If you have any questions about this ESA consultation, please contact Ms. Jennifer Jacukiewicz, natural resource specialist, at the number listed above or by e-mail at Jennifer.Jacukiewicz@noaa.gov.

cc: F/PR3
F/SER44 - R. Hartman

File: I514-22f.1 (LA)

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